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February 2025
Issue No 622,
Vol 53, No 2

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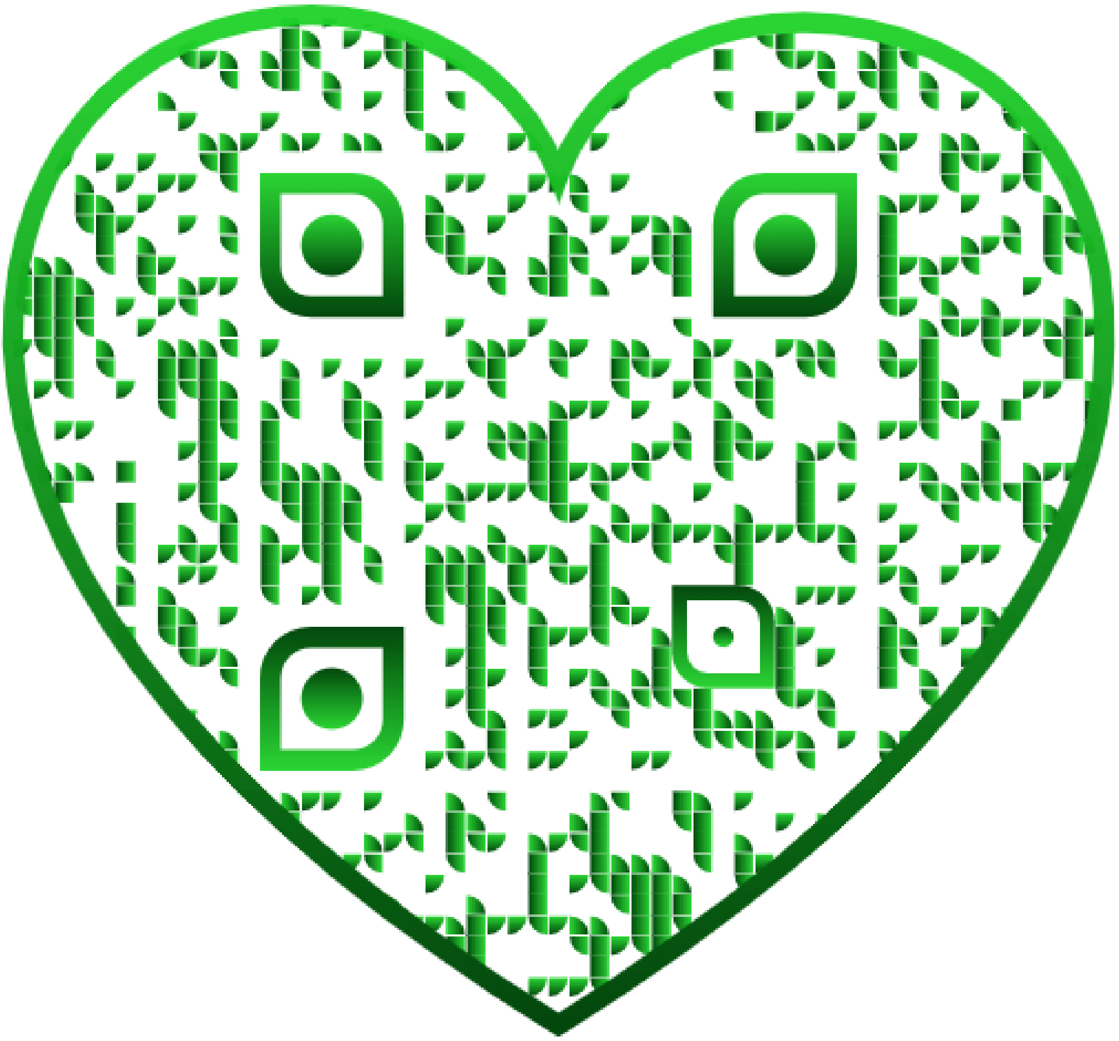

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91 DATABASE: SEPECAT JAGUAR
One of the RAF's most capable aircraft of the Cold War era, the Anglo-French strike jet proved its worth in the Gulf and successive campaigns — and is still in Indian service today. Denis J. Calvert, aided by ex-Jaguar pilots Pierre-Alain Antoine and Vikram Singh, is your guide to its history

COVER IMAGE: Vulcan B1 XH497, in service with No 617 Squadron, flying from RAF Scampton in November 1958. CROWN COPYRIGHT

From the Editor

CONNECT WITH *AEROPLANE*...

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RAF Coltishall was a tremendous airfield for an enthusiast to live nearby. During its heyday, the range of visiting aircraft from other NATO air arms was something to savour, as they conducted exercises alongside and exchanges with the resident Jaguar squadrons. And, in turn, having such a busy base in the vicinity could not help but foster deep affection for the Jaguar itself. Perhaps to some the Anglo-French strike jet wasn't the most charismatic aircraft, and the outright performance of the early versions could have been better. But it's the ability to do the job that counts, and talking to those who flew it with different air arms in various theatres, you're left in no doubt about that. As Pierre-Alain Antoine, retired French Air Force colonel and one of those who's helped Denis Calvert compile our Database feature this month, once told me, "The Jaguar was a very good aircraft in which to go to war."

> **" The retirement of the Jaguar happened with indecent haste "**

That antipathy towards the aeroplane was sometimes evident in the higher echelons, too, at least in Britain. Had the 1991 Gulf War not come along, the RAF Jaguar force could well have been retired later that decade. Its performance — and that of its very seasoned pilots and groundcrews — in 'Desert Storm' helped rescue it, and just as well. Tremendous pride was evident when the 'Desert Cats' returned to Coltishall post-deployment, the surrounding roads thronged with onlookers welcoming them home. As it was, the Gulf campaign assisted in giving the Jaguar some of the kit it had long needed: Sidewinder missiles for self-defence, CRV-7 rocket pods and new radios, for example. More was to come. The Jaguar 96 and 97 upgrades were models of how to execute such a programme in a timely, cost-effective fashion, and made an already very capable platform even more so. Finally, the uprated Adour 106 engine put an end to all the old jokes about it being underpowered.

When the end did come, the last RAF Jaguar unit, No 6 Squadron, had left Coltishall for Coningsby, and the retirement date was advanced at very short notice to the end of April 2007. It all happened with indecent haste. Rod Dean, who flew the type with RAF Germany and the Sultan of Oman's Air Force, told me a couple of years ago, "When they eventually got the kit sorted out — and yes, it took a while — it was damn good, and I still believe the RAF got rid of it far too early. It was a cracking little aeroplane". That it certainly was.

It's now with a sense of slight melancholy that I look back on the Jaguar era at Coltishall, the spiritual home of the machine and those who operated it. One was aviation artist Mike Rondot, a 'Jag' pilot for 12 years. He too contributes to our Database, but I couldn't help but recall something he said to me a while back: "We had the best job, we had the best aeroplane, we were on the best base". Amen to that.

Ben Dunnell

AEROPLANE
ESTABLISHED 1911

Aeroplane traces its lineage back to the weekly *The Aeroplane*, founded by C. G. Grey in 1911 and published until 1968. It was relaunched as a monthly in 1973 by Richard T. Riding, editor for 25 years until 1998.

THE AEROPLANE
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CONTRIBUTORS THIS MONTH

STEVE BLEE

Steve joined the nascent British Aerospace in 1978, after graduating from Salford University. He initially worked in structural design and stressing on the AV-8B and Harrier GR5, going on to the TAV-8B, Buccaneer, BAe 146 and PC-9 among others and becoming project engineer for Harrier GR5 full-scale fatigue testing. Transferring to airworthiness, he looked after in-service airworthiness support for Hawks, PC-9s, Buccaneers and Phantoms before becoming chief airworthiness engineer, a post he held until retirement at the end of 2020. With so many of the aircraft he worked on now being in museums, it is fitting he is now a member of the heritage team at the Brough site.

DAVID LEGG

David has been a Catalina enthusiast and researcher for 40 years, and has written many articles and two books on the type. He has been a volunteer with Catalina operator Plane Sailing Air Displays for the same period and flies with it as a crew chief, as well as co-founding The Catalina Society, so who could be better-placed to write about its past four decades of PBY activity?

STEPHEN LIDDLE

Growing up close to RAF Finningley, Steve was hooked by the annual September influx of Cold War hardware for the 'At Home' Day, especially the triangular ones. This became a professional interest, leading to a PhD in aerodynamics, using the same Avro wind tunnel as had the Vulcan. After minor contributions to the F-35 and more research, the last 15 years were spent trying to make F1 cars slightly quicker. In 2011 he became a trustee of Vulcan to the Sky, and combining that has resulted in a book, *Shaping the Vulcan*, published soon.

MAXIMILIAN MEINDL

Max's interest in aviation dates back to when, as an eight-year-old, he started reading everything about aircraft he could get his hands on. As poor eyesight rapidly put an end to his ambition to become a pilot, he started a career in the manufacturing sector in France and later Germany. Having been sent to Quebec for several years by his employer, he is currently discovering the rich and fascinating history of aviation in Canada — including a combat veteran Lancaster and well-preserved BCATP base.

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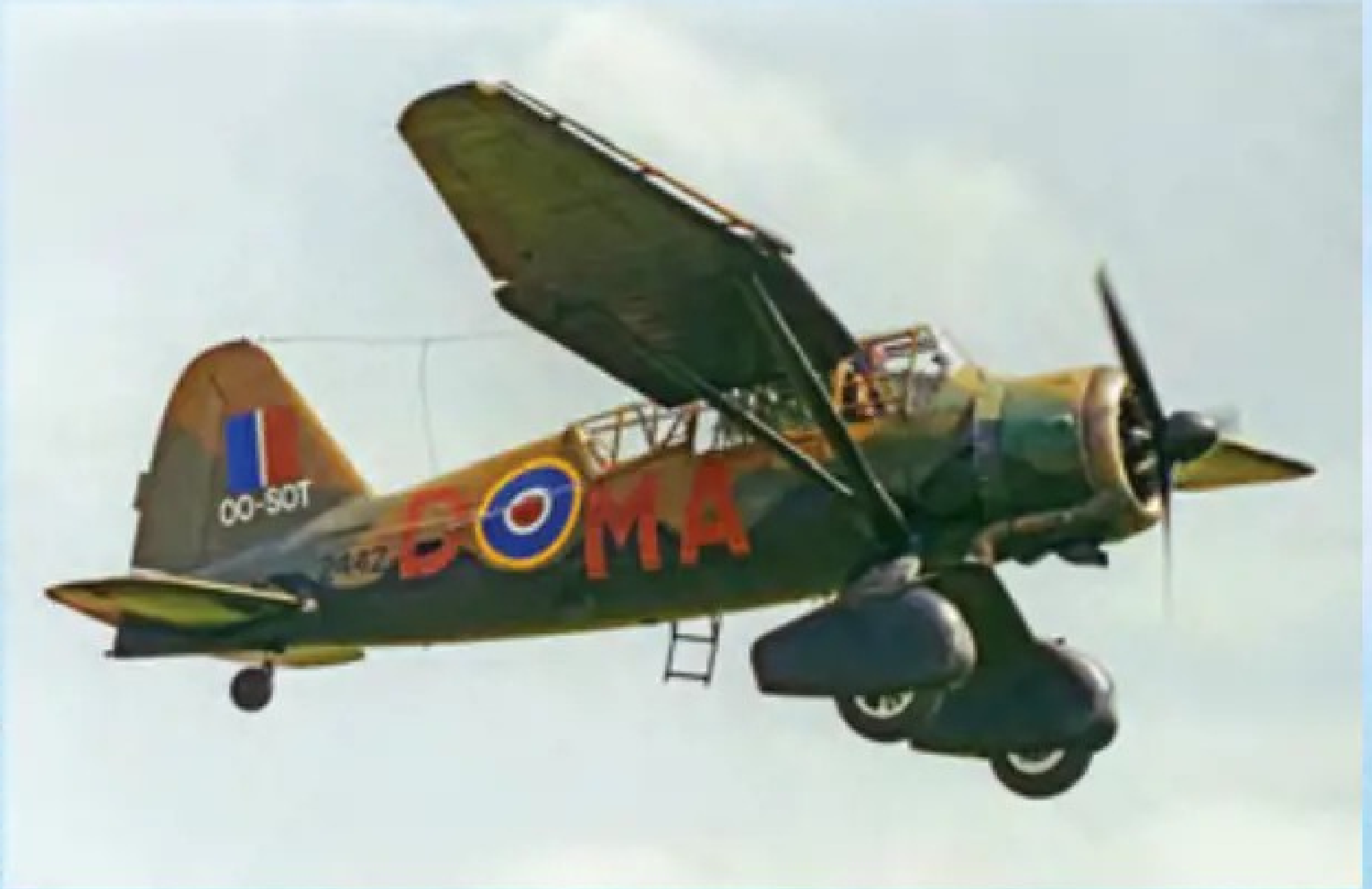
TFC buys Belgian Lysander

On 9 December the former Sabena Old Timers Westland Lysander IIIa, V9546/OO-SOT, went onto the British civil register as G-LYZY, following its acquisition by The Fighter Collection at Duxford. Manager at the collection, Jane Larcombe says, "TFC are delighted to confirm that the Westland Lysander G-LYZY will be joining the TFC fleet."

The Canadian-built machine hasn't flown since being damaged in a ground-loop while making a precautionary landing due to engine trouble at Brussels Zaventem Airport on 17 July 2001. Repairs — assisted by the acquisition of a second Canadian-built 'Lizzie' from the country of its birth, which arrived in Brussels during January 2003 — were completed by the late summer of 2008, and the Bristol Mercury engine was ground-run in the aeroplane that September. But, unfortunately, various factors worked against the return-to-flight project coming to fruition in Belgium.

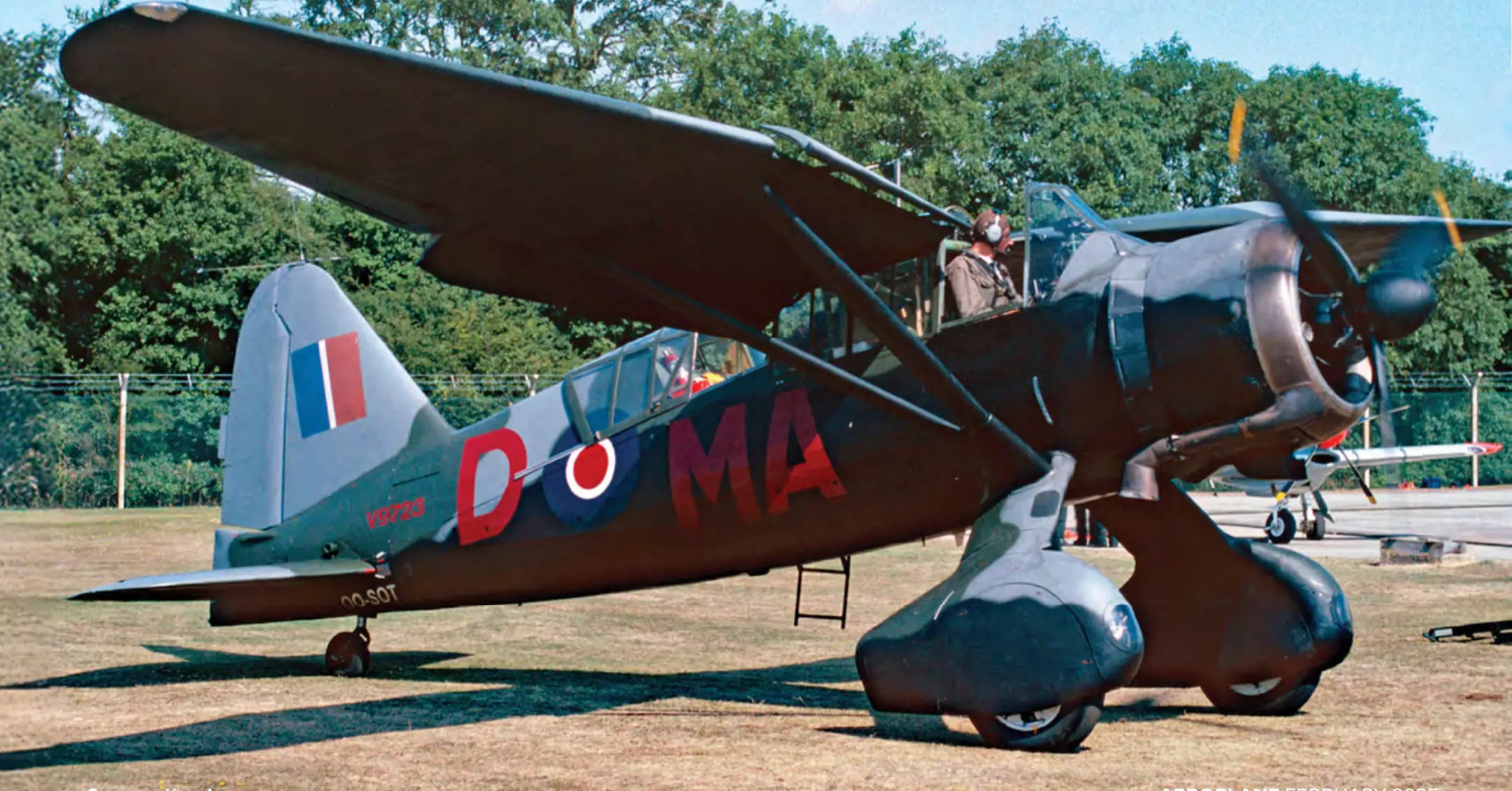


The Lysander as it was best-known on the display circuit, appearing at Duxford's Flying Legends show in July 1997. PETER R. MARCH

Among other British display visits, OO-SOT made a memorable appearance at the 1998 Flying Legends show at Duxford, making up one-third of a so far 'once-only in the preservation age' three-ship 'Lizzie' formation alongside the Shuttleworth Collection Lysander 'V9441'/G-AZWT and 'V9545'/G-BCWL, which was at the time being operated by the Duxford-based Aircraft Restoration Company. Later that year 'V9545' was acquired by Kermit Weeks for his Fantasy of Flight collection in Polk City, Florida, and is reported not to have flown even once since being exported.

TFC's new acquisition was taken on charge by the Royal Canadian Air Force as serial RCAF 2442 in October 1942, being declared surplus almost exactly four years later. It spent many years on a farm in south-western Saskatchewan, before being acquired by the Musée Royal de l'Armée in Brussels during 1971. Following 11 years in storage it went to the Sabena Old Timers Foundation at Saffraanberg, and later at Brustem, making its first flight from Brussels Zaventem on 27 August 1988. It wore the RAF codes MA-D of No 161 (Special Duties) Squadron, based at Tempsford in Bedfordshire, being repainted prior to the 1999 season in a different version of the special duties colour scheme with the serial V9723.

BELOW: Here visiting the Royal International Air Tattoo 1999 in the colour scheme it still wears, Lysander IIIa V9546/OO-SOT has been acquired by The Fighter Collection and went onto the British civil register as G-LYZY on 9 December. DENIS J. CALVERT



XH558 secure at Doncaster

More than nine years on from its last display appearance, Vulcan B2 XH558 now has a secure future at Doncaster Sheffield Airport. VTST

On 3 December the Vulcan to the Sky Trust received confirmation of the long-term future for Avro Vulcan B2 XH558 at Doncaster Sheffield Airport, following ongoing discussions with the City of Doncaster Council (CDC).

XH558 has been based at Doncaster Sheffield Airport since 2011. After its previous lease with Peel Holdings at Doncaster had been due to expire in June 2023, the charity was looking for a new home when news of the airport's imminent closure emerged.

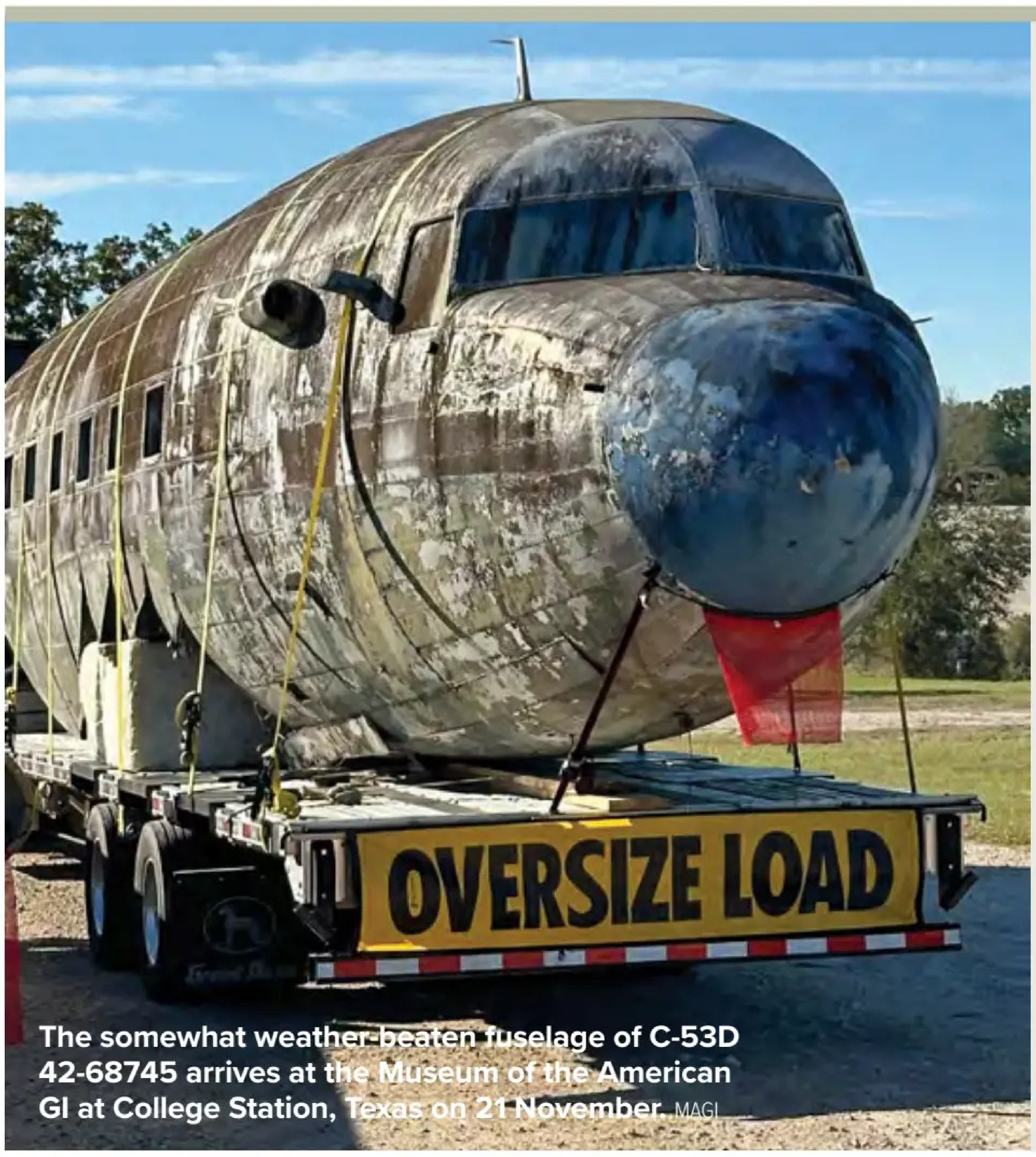
Conversations with CDC have continued to take place, as the council prepares to announce the new airport operator. Marc Walters, chief executive of VTST says, "We are thrilled that following ongoing conversations with the CDC and the team behind the bid to reopen Doncaster Sheffield Airport, we have had our longer-term future at the airport confirmed.

"This is fantastic news for the charity and its supporters as we feel that XH558 is in the right location, owing to her history and links with the airport, the former RAF Finningley. We hope that this will help with our mission to be able to tell the story of XH558 and to continue and expand our ongoing education programme, inspiring youngsters to follow exciting future careers in aerospace and engineering."

Christian Foster, programme director for South Yorkshire Airport City — the name of the project dedicated to reopening the airport — added, "We are looking forward to working with the VTST to put a lease in place that gives them some long-term security. XH558 made Doncaster Sheffield Airport its home back in 2011 and has welcomed thousands of visitors to Doncaster. People flocked to the site to see her fly and when she was located in a hangar, thousands came to find out more about this extraordinary piece of aviation history.

"The team behind the charity have ambitious plans to create the Vulcan Experience. We now hope this comes to fruition. What is important for now is that her welcome in Doncaster is extended and supporters are once again given the opportunity to see this feat of engineering up close."

The airport saw its first flying movement in two years on 6 December, when a Piper PA-31 Navajo of 2Excel Aviation — which previously maintained a major operational base at Doncaster — landed there. The company has been given permission to house aircraft there for maintenance over this winter.

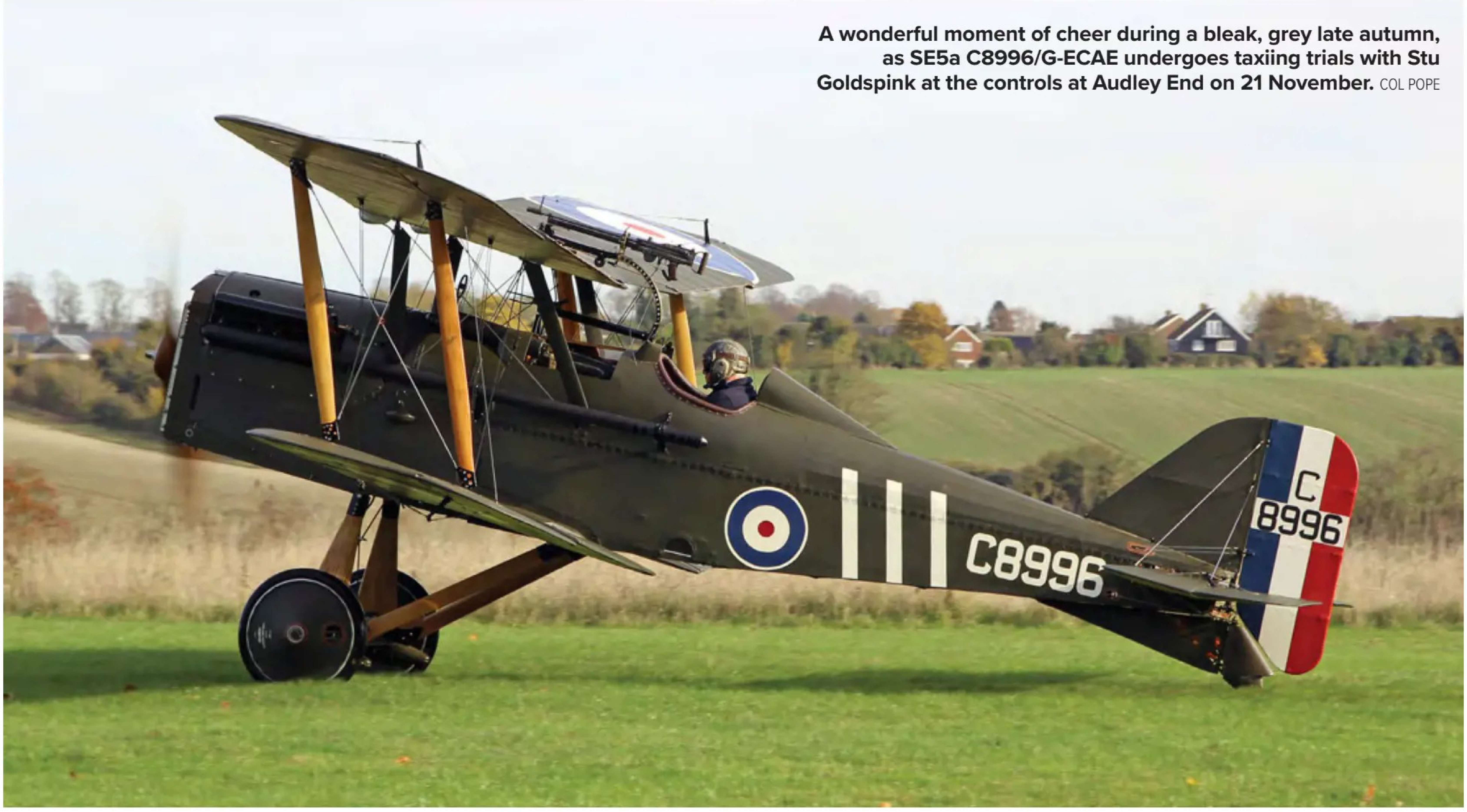


The somewhat weather-beaten fuselage of C-53D 42-68745 arrives at the Museum of the American GI at College Station, Texas on 21 November. MAGI

C-53 delivered to American GI Museum

Douglas C-53D Skytrooper 42-68745 arrived at the Museum of the American GI at College Station, east-central Texas on 21 November. The former US Army Air Forces machine was previously on display at the M. W. Hamilton Machine Museum in the city of Petal, Mississippi, alongside a former Royal Canadian Air Force North American B-25 Mitchell and a Grumman TF-9J Cougar.

Built at Santa Monica and delivered to the AAF on 7 April 1943, the transport didn't stray from the continental United States during wartime. Following conversion to DC-3A configuration, during January 1945 it went to United Air Lines with the fleet name *Mainliner New Jersey* and the civil registration NC49543. Sold on in February 1955, the machine spent the remainder of its flying career as a corporate transport, initially with IBM, and finally from April 1965 with Pan Air Corps at Lakeland Airport, New Orleans where, after its withdrawal and de-registration in June 1967 it became derelict before being saved from scrapping by the M. W. Hamilton Machine Museum.



A wonderful moment of cheer during a bleak, grey late autumn, as SE5a C8996/G-ECAE undergoes taxiing trials with Stu Goldspink at the controls at Audley End on 21 November. COL POPE

Original SE5a taxiing at Audley End

At Audley End airfield in north Essex, a significant milestone was reached in the return to flight of original Royal Aircraft Factory SE5a C8996/G-ECAE when well-known warbird pilot Stu Goldspink carried out successful taxi trials on 21 November.

Originally part of a 650-aircraft order placed with the Austin Motor Company at Longbridge, Birmingham in November 1917 for the Royal Flying Corps, it was delivered to the now Royal Air Force and taken on charge in June 1918. Post-war it was part of the Imperial Gift scheme batch of 35 SE5as sent to Australia, where it became A2-25.

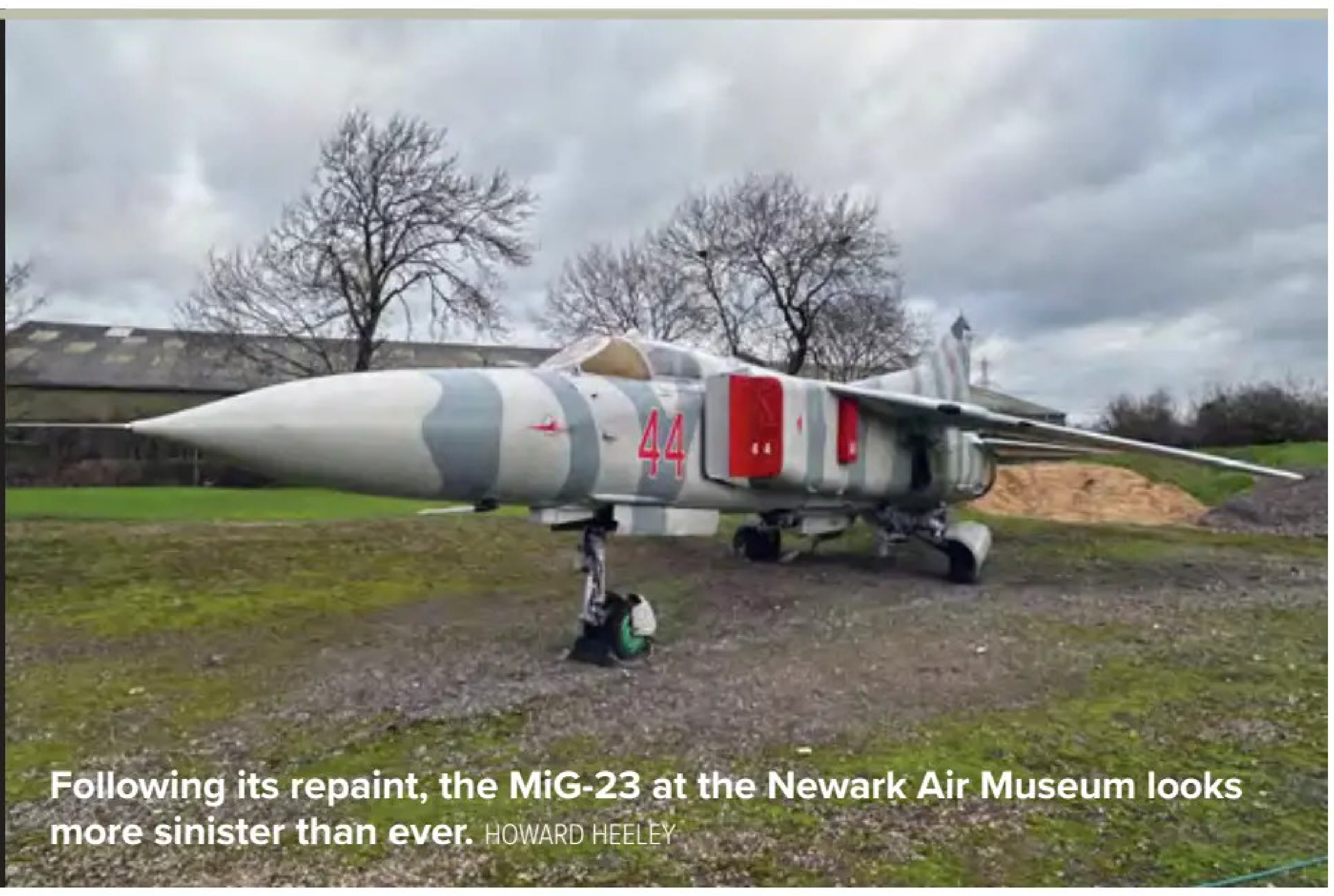
The airframe, including fuselage and wings, was later passed to the Munitions Supply Board for testing in August 1927, being struck off charge on 16 February 1929 before final disposal. The SE5a passed through several changes of ownership before moving to Europe and then the UK, where it was allocated the period registration G-ECAE in 2010. A lengthy restoration of the airframe structure was undertaken at Tony Ditheridge's Hawker Restorations and subsequently Hawker Aeronautical Engineering (HAE) at Milden in Suffolk. In November 2020 the completion of the rebuild to flying condition was entrusted to Vintage Fabrics and C8996 relocated to its hangar at Audley End. Engineer Col Pope, assisted by woodwork specialist Richard Watson of HAE, carried out a comprehensive rebuild programme, including installation of flying control cables and an original Hispano-Suiza 200EX engine complete with related fuel, oil and pneumatic systems. Fabric-covering and painting were undertaken by Clive and Andrew Denney.

The 1917 Peugeot-built Hispano-Suiza 200EX powerplant was rebuilt to zero-time condition by Vintage Engine Technology and initial test runs were undertaken in the summer of 2024 by its chief engineer Paul Sharman. Reassembly and rigging of the aircraft was completed last autumn. It is expected that flight trials will be undertaken in the early part of 2025 and hopefully the 107-year-old fighter will be displayed in the UK later in the year. ***Col Pope***

'FLOGGER' REPAINTED AT NEWARK

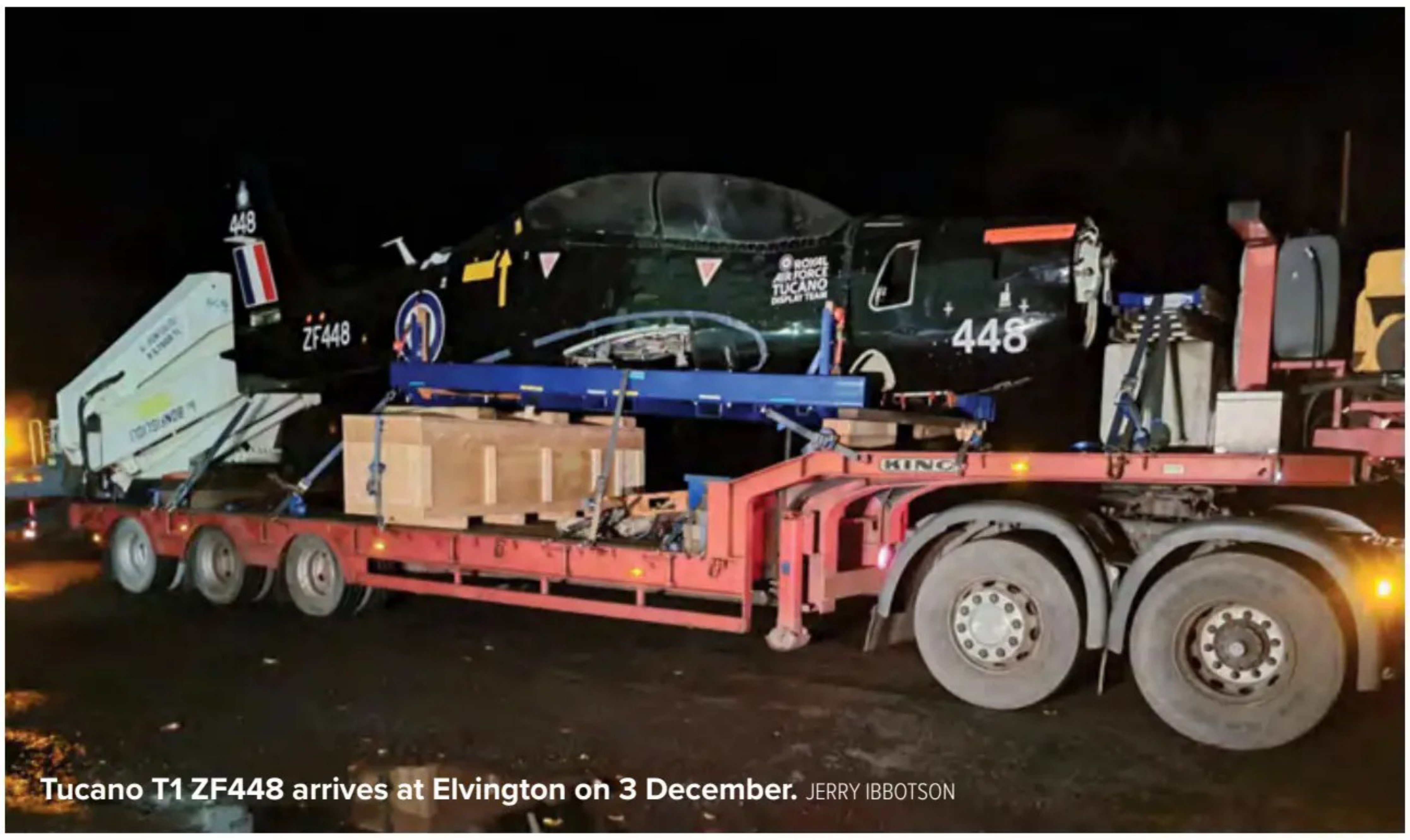
Better-than-anticipated weather conditions during the autumn months have enabled the volunteers at the Newark Air Museum to complete the repaint work on Mikoyan-Gurevich MiG-23ML 'Flogger' c/n 024003607. This extensive task has seen the application of a new set of markings to the MiG-23, which — along with Newark's MiG-27, c/n 61912507006 — was taken off-site back in 2019 for use in the filming of the Marvel movie *Black Widow*. Completion of the MiG-23 repaint has ensured both aircraft have now been returned to a good display standard.

Both the MiG-23 and MiG-27 are the only examples of these variable-sweep Soviet types on display in UK museums, and are granted 'significant' status on Aviation Heritage UK's National Aviation Heritage Register.



Following its repaint, the MiG-23 at the Newark Air Museum looks more sinister than ever. HOWARD HEELEY

Display Tucano arrives at YAM



Tucano T1 ZF448 arrives at Elvington on 3 December. JERRY IBBOTSON

Shorts Tucano T1 ZF448 arrived at the Yorkshire Air Museum at Elvington on 3 December on a low-loader from RAF Shawbury, Shropshire. Its new home is just 21 miles south-east of the old RAF Linton-on-Ouse, from where the trainer was operated as the RAF's Tucano Display Team machine until retirement of the type from service on 25 October 2019. The move was undertaken by Jet Art Aviation of Selby, North Yorkshire. Reassembly of the aeroplane will begin during early 2025.

Museum communications manager Jerry Ibbotson says, "It's a great addition to our collection and boosts the number of training aircraft we have, which includes Jet Provosts and a Hunter among others. Huge thanks go out to the RAF Heritage team for allowing us to have the aircraft, and to Jet Art for moving it to YAM. Big thanks also to YAM team members Charles and Graham for helping get it under cover in the cold and dark."

To mark the retirement of the Tucano after 31 years of RAF service, for 2019 ZF448 gained the badges of every unit that had operated the type. It had previously flown with the name *Basuto* painted below the cockpit on the port side, this recalling how No 72 Squadron, the last Tucano squadron at Linton-on-Ouse, received presentation Spitfires from what was then Basutoland — now Lesotho — during World War Two.

In addition, Tucano ZF167 arrived at the South Yorkshire Aircraft Museum in Doncaster in late November, completing its collection of types which were operated in the training role from nearby RAF Finningley. The aeroplane was transported from the Ulster Aviation Society in Lisburn, which has been allocated ZF378 *Enniskillen* by RAF Heritage.

BADA Trophy to Navy Wings

Navy Wings director of flight operations Al McLaren (left) and chief engineer Jim Norris with the BADA Trophy in front of Swordfish W5856 at Yeovilton. NAVY WINGS

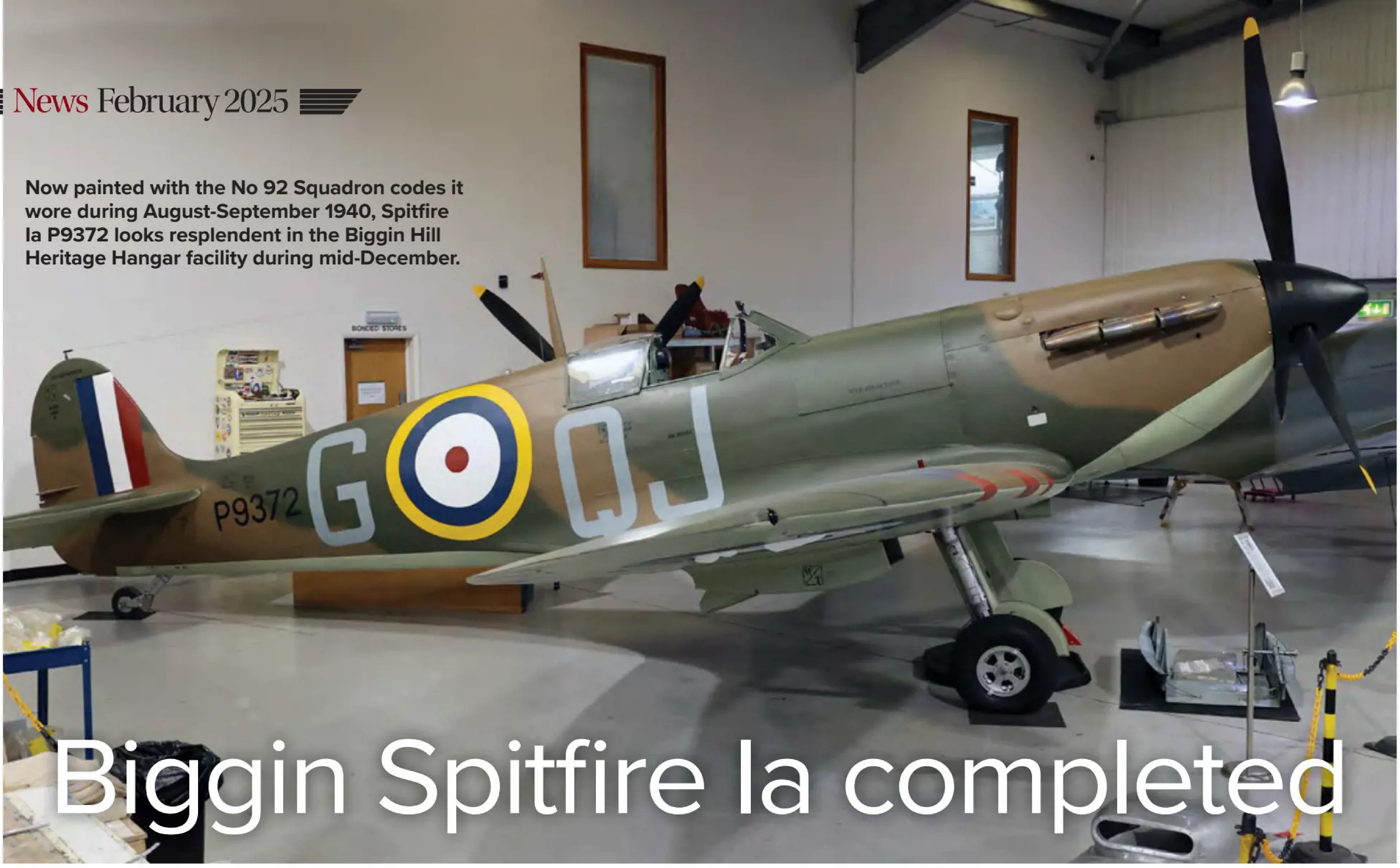
The British Air Display Association Trophy for 2024 has been awarded to the Yeovilton-based Navy Wings organisation. It recognises an individual or organisation's excellence and contribution to the airshow world, particularly demonstrating BADA's aims, "to encourage, promote and advance safety and standards in British air displays."

Navy Wings flight ops director Alistair McLaren says, "Being awarded the BADA Trophy is fantastic recognition for Navy Wings. Ex-military aircraft, even more so than other types of aircraft, require the highest standards of airworthiness, operational management and pilot competency and the BADA Trophy recognises the professionalism, expertise and deeply embedded ethos of flight safety of everyone at Navy Wings."

The award citation read, "Navy Wings' support to air displays around the country with its collection of aircraft has been exceptional in 2024, especially with the Fairey Swordfish, W5856, undertaking some very long cross-country transits in order to participate in as many displays as possible — and that in an aircraft with a 90kt cruise speed!"

This year Navy Wings not only participated in more than 60 flying displays and events the length and breadth of the country, including Scotland and Northern Ireland, reaching audiences of nearly three million, but its fleet also stepped in to support the Royal Navy when availability of naval aircraft was severely limited due to the pressure of front-line operations. The Swordfish attracted considerable interest, painted in D-Day markings, and was a highlight at the D-Day 80 commemorations.

"Keeping the history and story of naval aviation in the public eye is a fundamental aim of the charity and our contribution and reach and this year has been unprecedented", said Navy Wings CEO Jock Alexander. "It was difficult to know how we were going to top the success of the 2023 season but we flew well over 300 hours this year and the award of the BADA Trophy at the end of it has been a tremendous accolade to a small charity flying the flag for Britain's great naval aviation heritage."



Now painted with the No 92 Squadron codes it wore during August-September 1940, Spitfire Ia P9372 looks resplendent in the Biggin Hill Heritage Hangar facility during mid-December.

Biggin Spitfire Ia completed

Nearly 85 years after it made its last flight from RAF Biggin Hill during the Battle of Britain, in early December Supermarine Spitfire Ia P9372 moved under its own power again as its five-year restoration to fly at the Biggin Hill Heritage Hangar approached conclusion.

Built at Woolston in February 1940, P9372 was delivered to No 92 (East India) Squadron the following month. It only ever flew operationally with 92; during May-June it was based at RAF Hornchurch, from where it suffered combat damage, and after repairs at Brize Norton it rejoined the unit at Biggin on 27 July.

On the late afternoon of 9 September, Plt Off William Watling came off second-best while flying P9372 during a dogfight with Messerschmitt Bf 109 Es, bailing out over East Guldeford near Rye, East Sussex after suffering serious burns to his hands and face. Watling then became one of the first pilots to be treated by pioneering plastic surgeon Sir Archibald McIndoe at the Queen Victoria Hospital in East Grinstead.

After returning to No 92 Squadron, Watling got a probable Bf 109 on 2 November, damaging another on 1 December, to add to the Junkers Ju 88 he had shot down on 14 August. During the early morning of 7 February 1941, 20-year-old Watling, still with 92, took off from Manston in Spitfire Ib R6924 on a weather check and soon flew into high ground near Deal in bad visibility. He is buried in the St Mary Cray Cemetery at Orpington, Kent.

The remains of P9372 were excavated during the late 1970s by aviation archaeologist Malcolm Petitt, and for the next three decades it was displayed at the Tonbridge Battle of Britain Museum. Biggin Hill Heritage Hangar owner Peter Monk acquired '9372 in 2016, and parts were displayed on the wall in the hangar until Dutchman Frits van Eerd purchased it. He decreed that it should be restored to incorporate as many original parts as possible. Speaking to Tom Baker for Key Publishing during 2023, Peter Monk explained, "We haven't just built a new airframe and put the serial number on it, we've gone a lot further. We've been able to use the tail strut and tailwheel assembly, and, after discussion with the owner, we've even added the original repair patches fitted to P9372 after it received damage over Hornchurch."

After the maiden flight, it is expected that P9372 will remain in the UK for a couple of years before heading to a new home in the Netherlands.

> *"P9372 came off second-best in a dogfight with Bf 109 Es"*

NEWS IN BRIEF

SEA HAWK TO AEROPARK

Hawker Sea Hawk FB5 WF299 left the Birlingham Jet Aircraft Collection near Pershore, Worcestershire, on 26 November, heading for the East Midlands Aeropark where it will be restored with new owner Dave Warren.

MARS ABORTS

Martin JRM-3 Mars BuNo 76820/C-FLYK *Philippine Mars* (see last month's news pages) made its first test flight from Sproat Lake, British Columbia prior to delivery to the Pima Air & Space Museum in Arizona on 3 December. Unfortunately an attempted ferry flight to Arizona, via San Francisco, on 11 December had to be abandoned due to an engine oil pressure problem and the giant flying boat returned to Port Alberni on Sproat Lake for further attention.

AVIATION BOOKSHOP MOVES

The Aviation Bookshop — a long-running establishment of world renown — closed its Vale Road, Tunbridge Wells, Kent premises during December, and from 1 January will operate, by appointment only, from Unit 1062 c/o Storage King Tunbridge Wells, Longfield Road, Tunbridge Wells TN2 3EY. For details contact info@aviation-bookshop.com.

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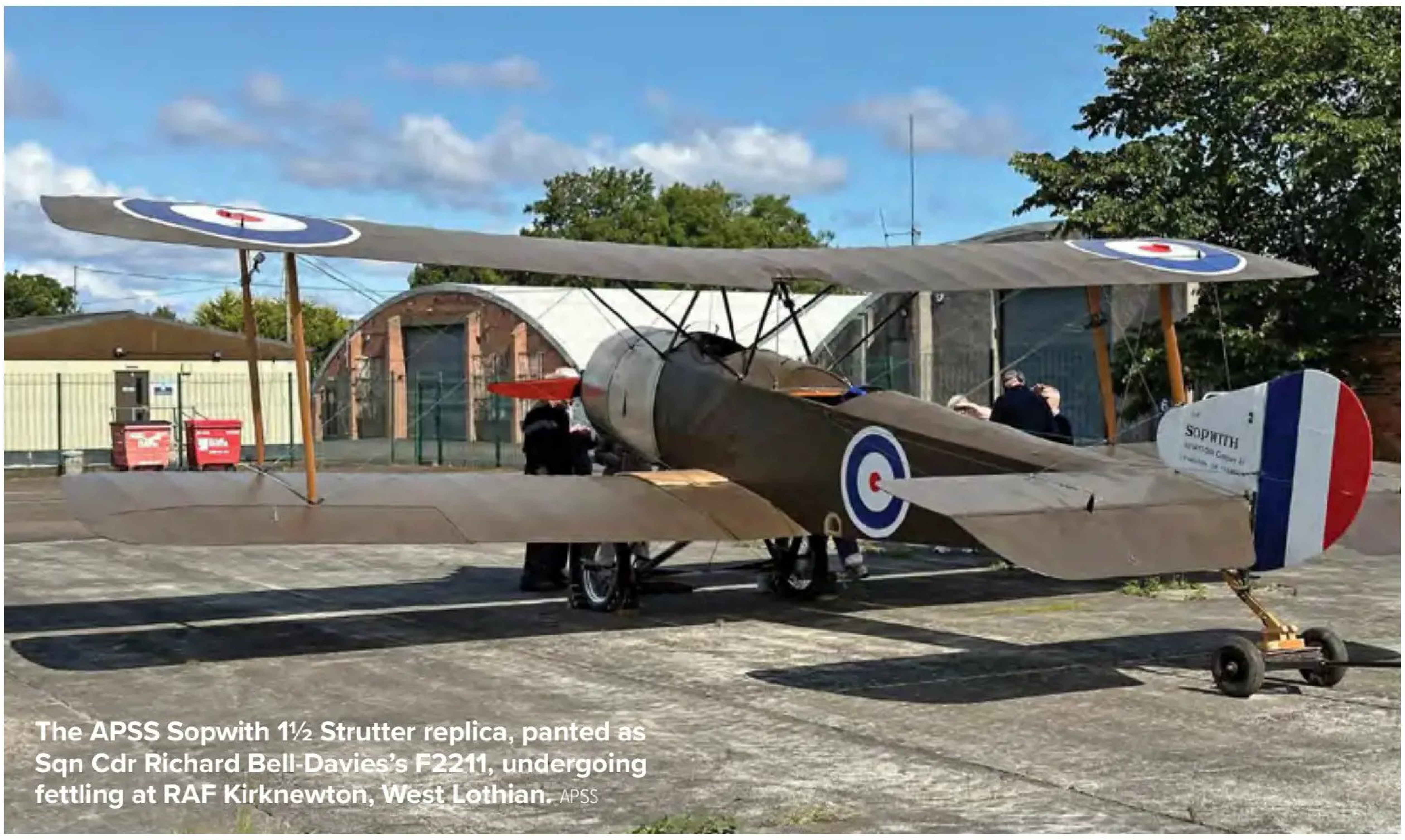
Scottish 1½ Strutter replica flies

On 23 November the Aircraft Preservation Society of Scotland announced the successful, official maiden flight of its Sopwith 1½ Strutter replica, 'F2211'/G-CMDN, at RAF Kirknewton, West Lothian, the home of No 661 Volunteer Gliding Squadron. Twenty-four years after construction began, Tim Raynor, a Light Aircraft Association inspector, was at the controls of the two-seat biplane.

The APSS was formed in 1973 at the Museum of Flight at East Fortune. During 2000 the curator of the museum asked if the society would be interested in building a replica First World War aircraft, and the 1½ Strutter, which has strong Scottish connections, was chosen.


The APSS Sopwith 1½ Strutter replica, panted as Sqn Cdr Richard Bell-Davies's F2211, undergoing fettling at RAF Kirknewton, West Lothian. APSS

Led by Evan Pole, a total of 30 APSS volunteers from across East Lothian — many with backgrounds in engineering — have been involved in construction of the machine although, sadly, only two of the original 20 men who started work on the 1½ Strutter were still alive to see the project come to fruition. Following a change of policy at the museum, during early 2017 the project was evicted from East Fortune, and the team moved to a workshop at Congalton Gardens in nearby North Berwick.

The aeroplane is powered by a 150hp Rotec radial engine in place of the original 130hp Clerget 9B nine-cylinder rotary.

> *"A total of 30 volunteers were involved in construction"*

It has been painted in the markings of the 1½ Strutter flown by Sqn Cdr Richard Bell-Davies who, on 24 September 1916, made what went down as the first landing on a bare-steel, unobstructed ship's flight deck using arrester gear during the sea trials of HMS *Argus* — considered to be the first true aircraft carrier — in the Firth of Forth.

B-25 AVAILABLE IN ARGENTINA

At Ildefonso Durana airfield, 44 miles west of Buenos Aires, Argentina, North American TB-25J Mitchell 44-31173 has been put up for sale following its owner's recent move to the USA. This former 'tramp steamer' had been under restoration to fly by Gustavo M. Passano and his team since arriving at Ildefonso Durana in 2010 from Santiago del Estero-Malpaso Airport, where it acted as a gate guard from 1976-2008, gradually lapsing into dereliction by the end of its tenure at that location in the north of the country.

The machine has been in South America for more than 60 years. Sold as surplus from storage at Davis-Monthan AFB, Arizona in 1959, 44-31173 was acquired by one Enrique Decurneux and allotted the registration LV-POP for the ferry flight south to Argentina, being operated by Decurneux for the following 20 years as a freighter. In 1971 it was bought by Empresa Provincial de Aviacion Civil de San Juan, named *Huairia Bajo*, and continued work as a freighter until it was impounded at Mar de Plata during August 1969 for liquor smuggling from Paraguay. In December of that year it went 'legit' with the Santiago del Estero Aeronautical Directorate flying aerial survey operations, before going on display at its final operational base, Santiago del Estero-Malpaso Airport, seven years later.

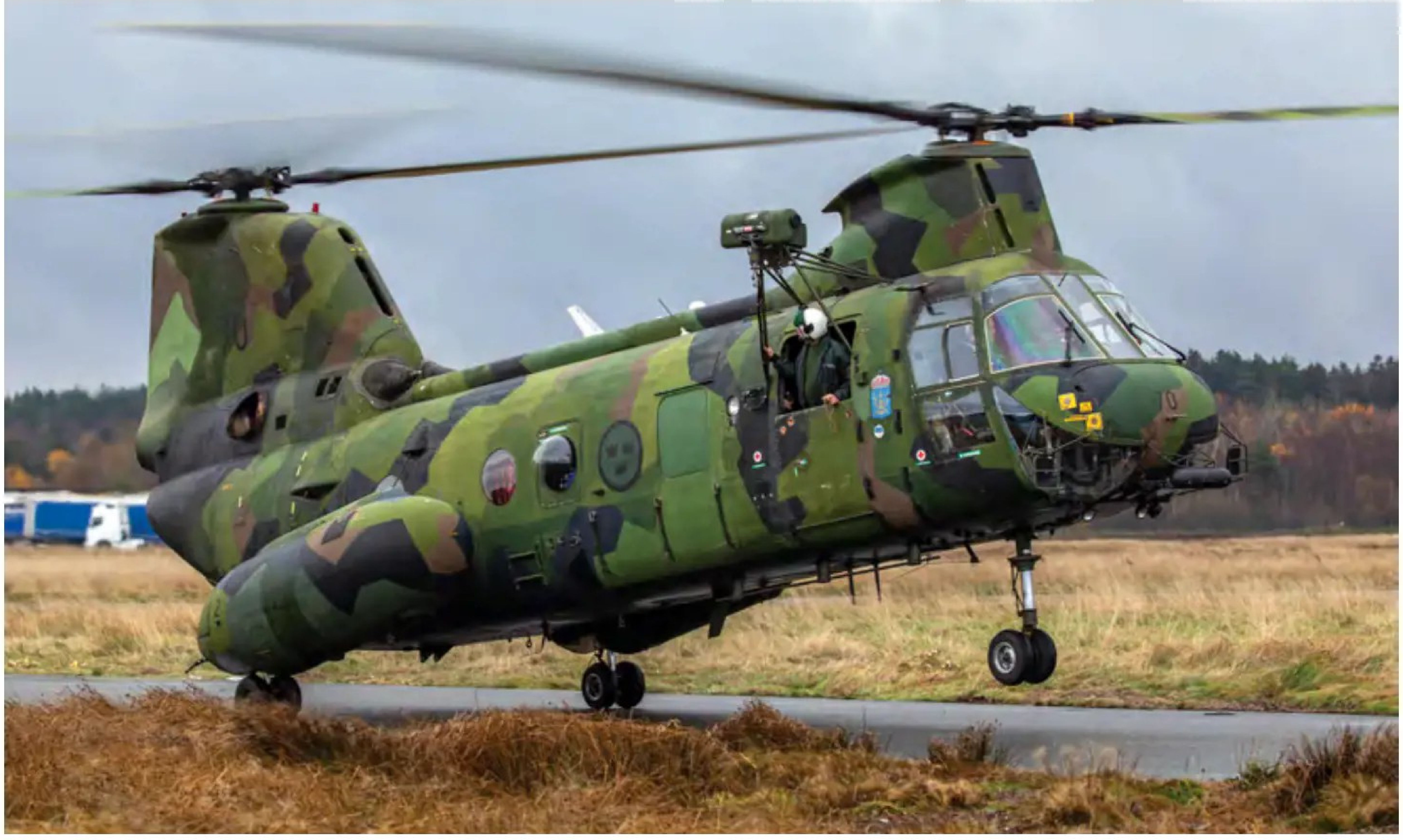
Ricardo Birsa, who is handling the sale, says, "After 12 years under restoration to fly, the B-25 is almost ready. The engines and propellers have been overhauled. The fuselage, wings and undercarriage are completed, so just some electric connections have to be finished there, and also the hydraulic systems. I think that a team of four people could finish it in about two or three months.

"Spares include two 'new old stock' tyres, magnetos and starters. We also have the original top turret, still not restored but with dummy .50 machine guns, and four cannon barrels for the other positions. There are thousands of pictures of all the restoration process, invoices, plans, manuals, and memorabilia. The price for the B-25 is US$950,000."

Regarding its colourful history, Ricardo says, "The airplane was imported with the false excuse that it was going to be used as a massive fumigation airplane. It was really used to smuggle goods from Paraguay to Argentina. It carried cigarettes, whisky and Spica transistor radios over a period of six years to the city of Mar del Plata. The cigarettes and liquor were consumed in the local casino and the radios sold to members of the public.

"This continued until a landing during a storm which saw the airplane veer off the runway. When the security service arrived they found the B-25 to be full of contraband, which

Swedish Vertol back in the air

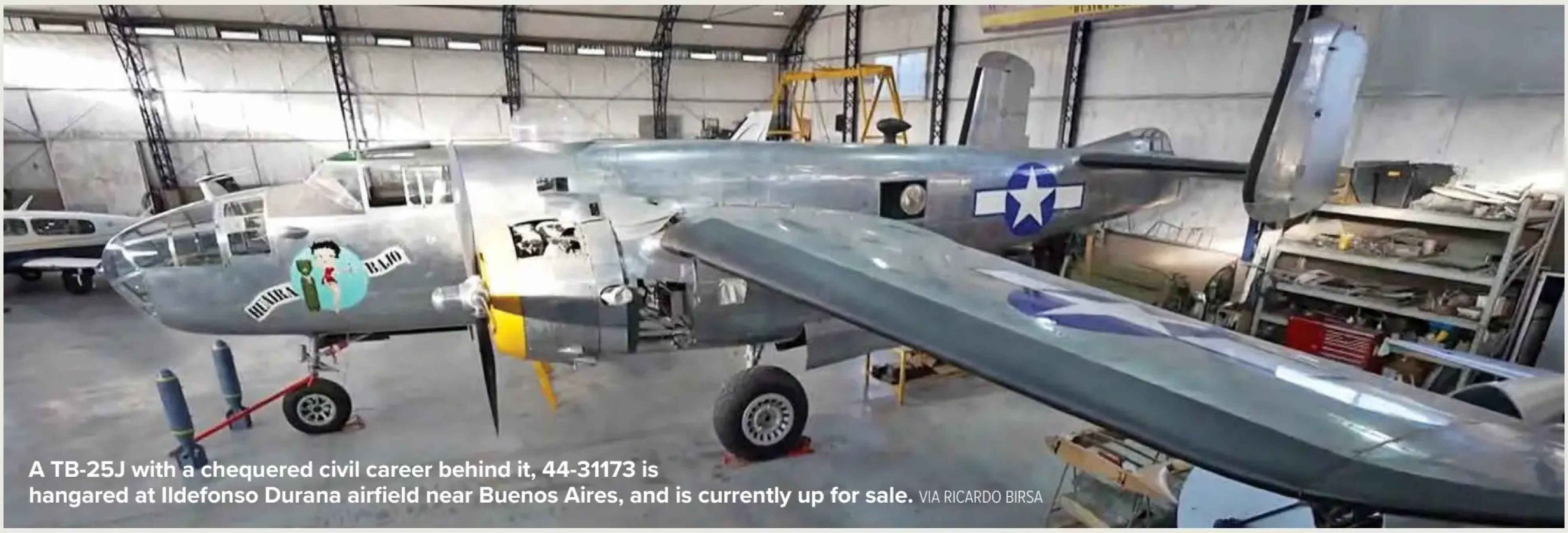


Wearing one of the most spectacular camouflage schemes ever seen on a helicopter, Kawasaki-Vertol HKP 4 04070/SE-JLY gets airborne at the Aeroseum near Gothenburg on 7 December. DAVID PEACOCK

On 7 December, former Swedish Navy Kawasaki-Vertol HKP 4 SE-JLY flew again at the Aeroseum at Säve Airport, just north-west of Gothenburg, following the successful completion of work by the Vertolens Vänner association to ensure the reliability of its hydraulic system. In preparation for celebrations to mark the navy's 500th anniversary during 2022, a hydraulic servo had started leaking oil, causing the helicopter — which had first flown on the civil register in September 2018 — to be grounded while fundraising and rectification were carried out. In addition to air display appearances, it is hoped the HKP 4 — which served with the Swedish military as 04070 — will also be available for pleasure flights during 2025.

Delivered to the Swedish naval air arm during 1973, 04070 entered service during 1974, and was operated by the 2:a Helikopterdivisionen at Säve for most of its career before being retired in 2006. It was transferred to the Swedish Air Force Museum in Linköping which then placed the spectacular, splinter-camouflaged machine with the Aeroseum. As part of the Aeroseum organisation, former officers and civilians from the 2:a Helikopterdivisionen joined together in 2013 with the intention of getting 04070 flying on the Swedish civil register. That organisation subsequently morphed into the Vertolens Vänner support group.

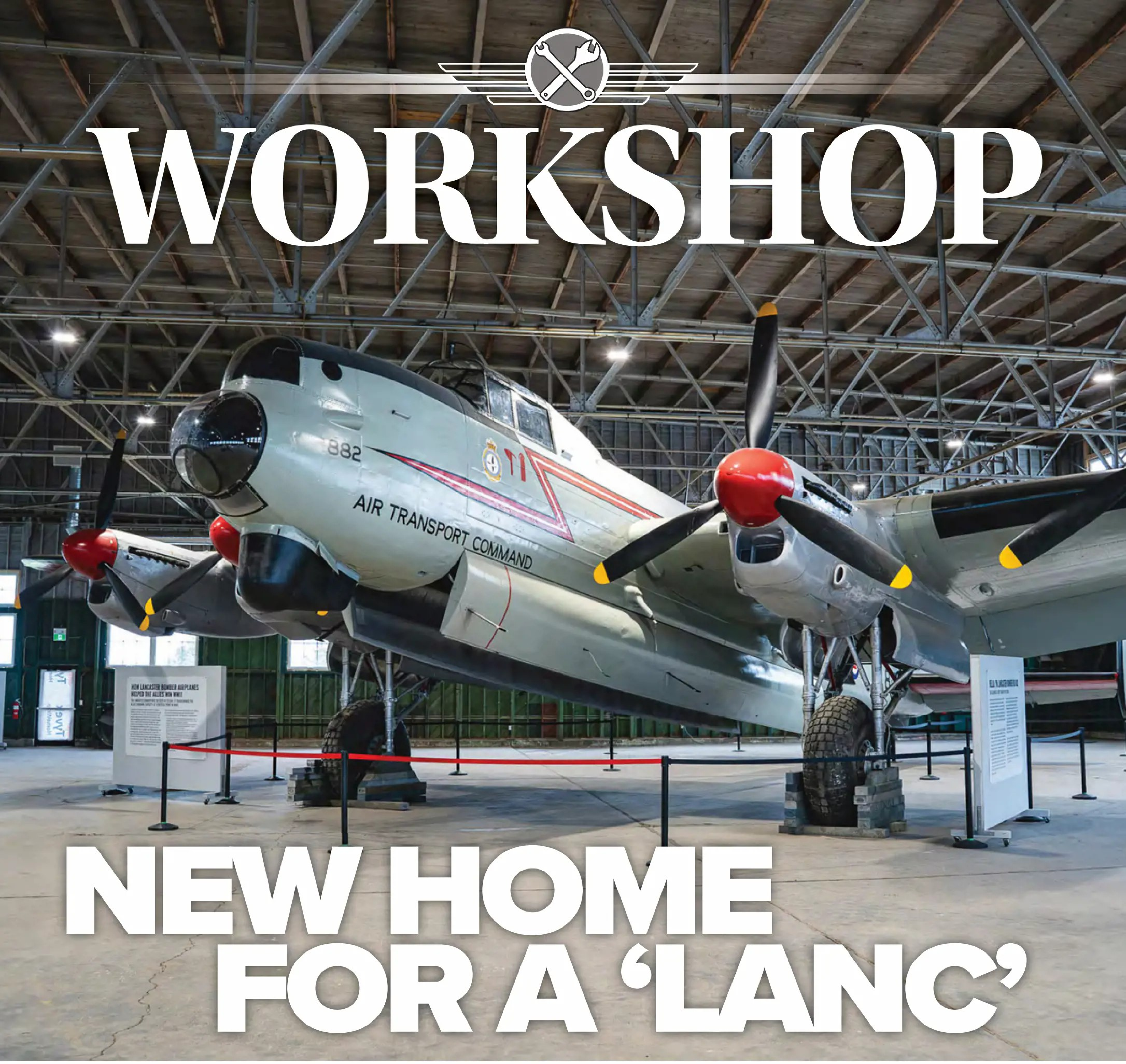
The Boeing-Vertol 107 made its initial flight in April 1958. Delivery of the first of the twin Rolls-Royce Gnome H1400-1 turboshaft-powered HKP 4 variants to the Swedish Navy came on 1 October 1961. A total of 22 examples served with the military in Sweden in a multitude of roles, including minesweeping, submarine-hunting, medevac, cargo, utility, firefighting, rescue and transport duties. The last was retired on 1 March 2011 after 48 years of service.



A TB-25J with a chequered civil career behind it, 44-31173 is hangared at Ildefonso Durana airfield near Buenos Aires, and is currently up for sale. VIA RICARDO BIRSA

resulted in the crew going to jail. The airplane was then confiscated and the province of Santiago del Estero took possession, using it to do a photographic survey of the entire province. It was also used in the photographic survey prior to the building of the Yacyretá Dam hydro-electric scheme on the Paraguay/Argentina frontier, with the two countries ultimately sharing the resulting electricity.

"Finally, due to the economics of operating the B-25, it was abandoned in a hangar in Santiago del Estero province until someone decided it would look good on display at the aerodrome, where it was damaged, and even used for target practice before the current owner saw it and decided to give it another chance and bought it". For details contact us1exports@gmail.com.



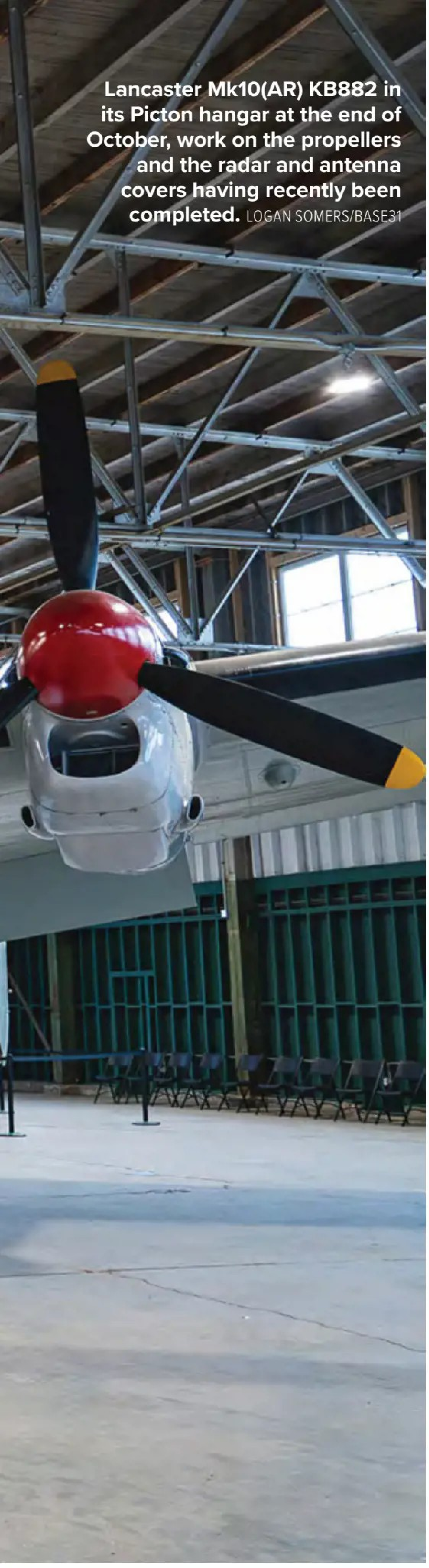
WORKSHOP

NEW HOME FOR A 'LANC'

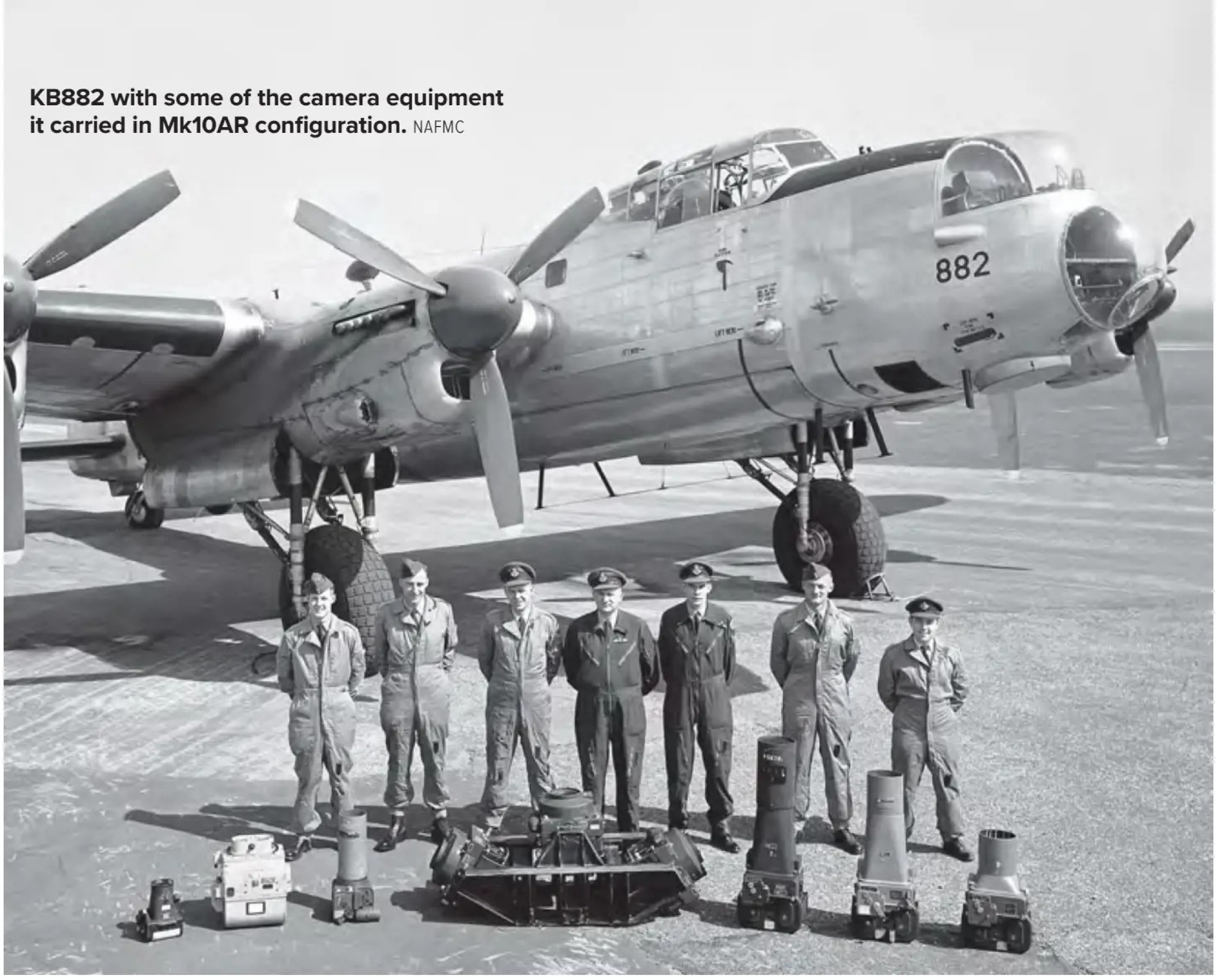
After many years as a gate guardian, the restoration of the National Air Force Museum of Canada's Avro Lancaster Mk10AR KB882 has progressed sufficiently for it to be assembled and unveiled at a temporary display location, before its permanent exhibition in Trenton **WORDS:** MAXIMILIAN MEINDL

Genuine combat veteran Lancasters are rare things these days, but this is just one of the reasons why the National Air Force Museum of Canada's Mk10AR, KB882, is a special survivor. It was built as a standard MkX by Victory Aircraft in Malton, Ontario, in November 1944. After arriving in England during March 1945, it was assigned to No 428 'Ghost' Squadron, part of No 6 Group. Based at Middleton St George, it participated in 11 raids on Germany during the last few weeks of the war. With the end of hostilities in Europe and an initial assignment to the short-lived Tiger Force, it was put into storage and escaped the scrapman's torch for more than a decade.

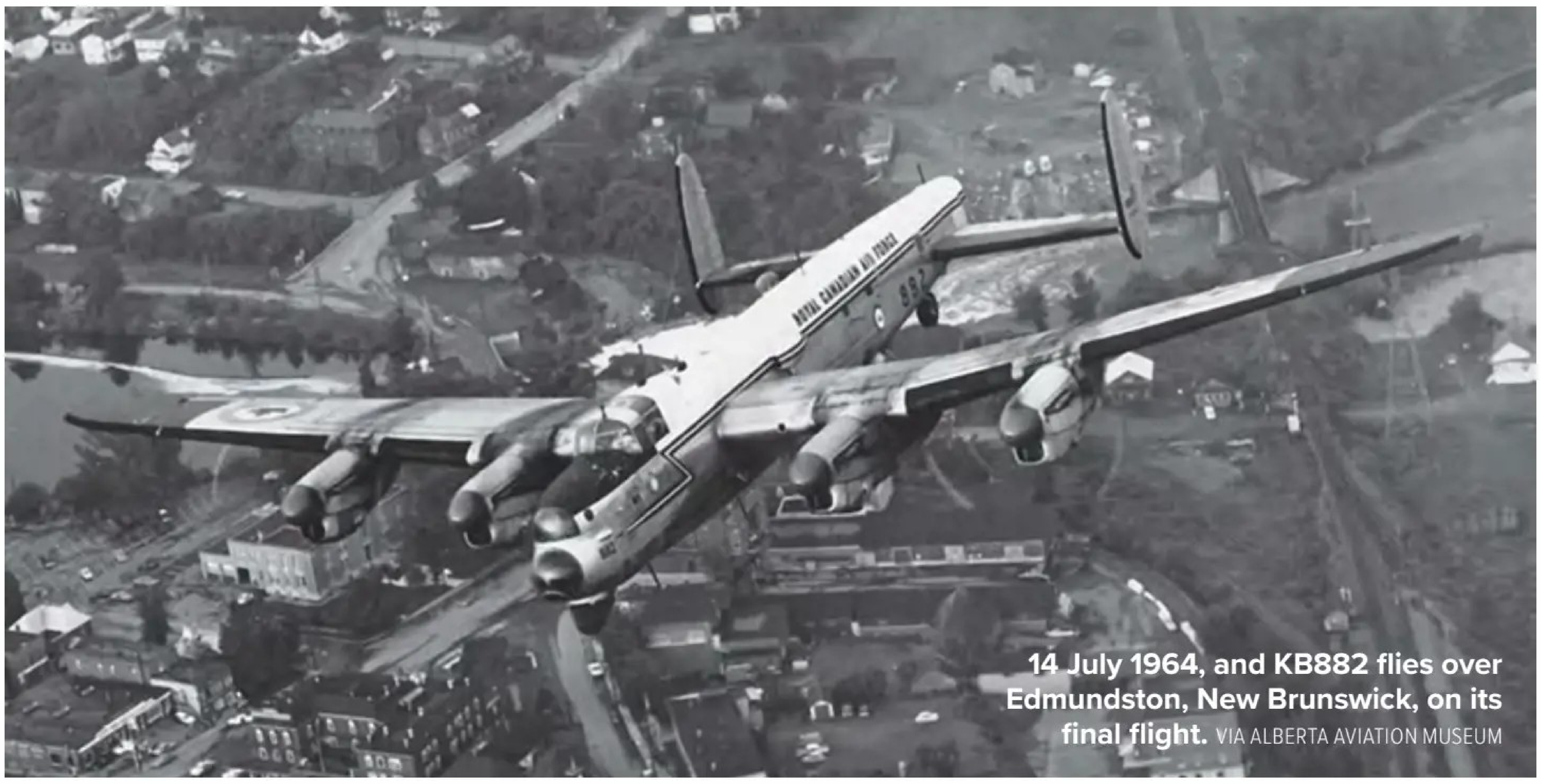
In 1956, KB882 was returned to active service with the Royal Canadian Air Force and modified to Mk10AR (Area Reconnaissance) standard, the most visible element of this being a nose extension to house the additional radar and camera equipment, as well as the fairing-over of the turrets. As part of No 408 'Goose' Squadron, it was used for tasks ranging from photo-mapping over the Canadian north to intelligence-gathering and photo-reconnaissance during



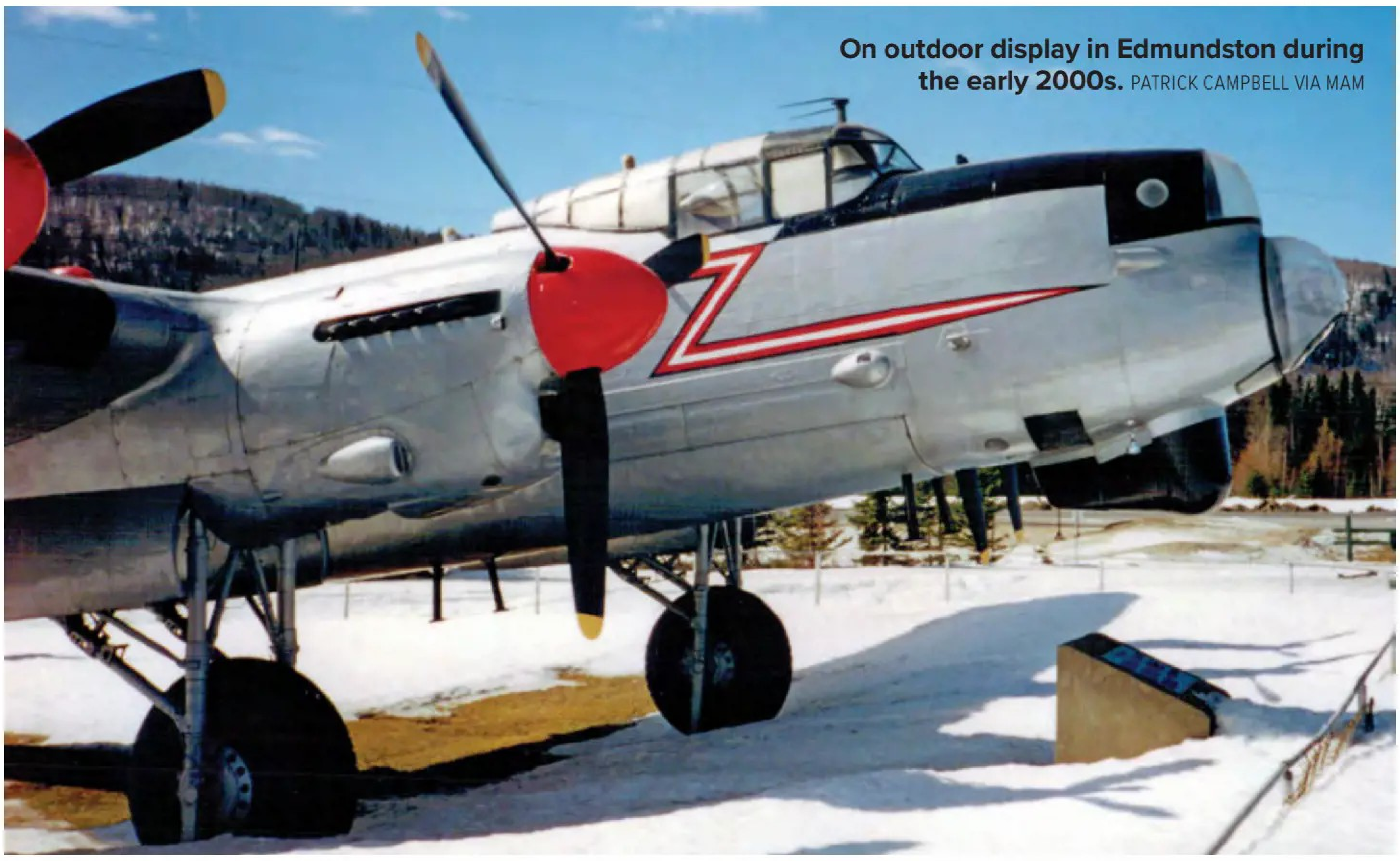
Lancaster Mk10(AR) KB882 in its Picton hangar at the end of October, work on the propellers and the radar and antenna covers having recently been completed. LOGAN SOMERS/BASE31



KB882 with some of the camera equipment it carried in Mk10AR configuration. NAFMC



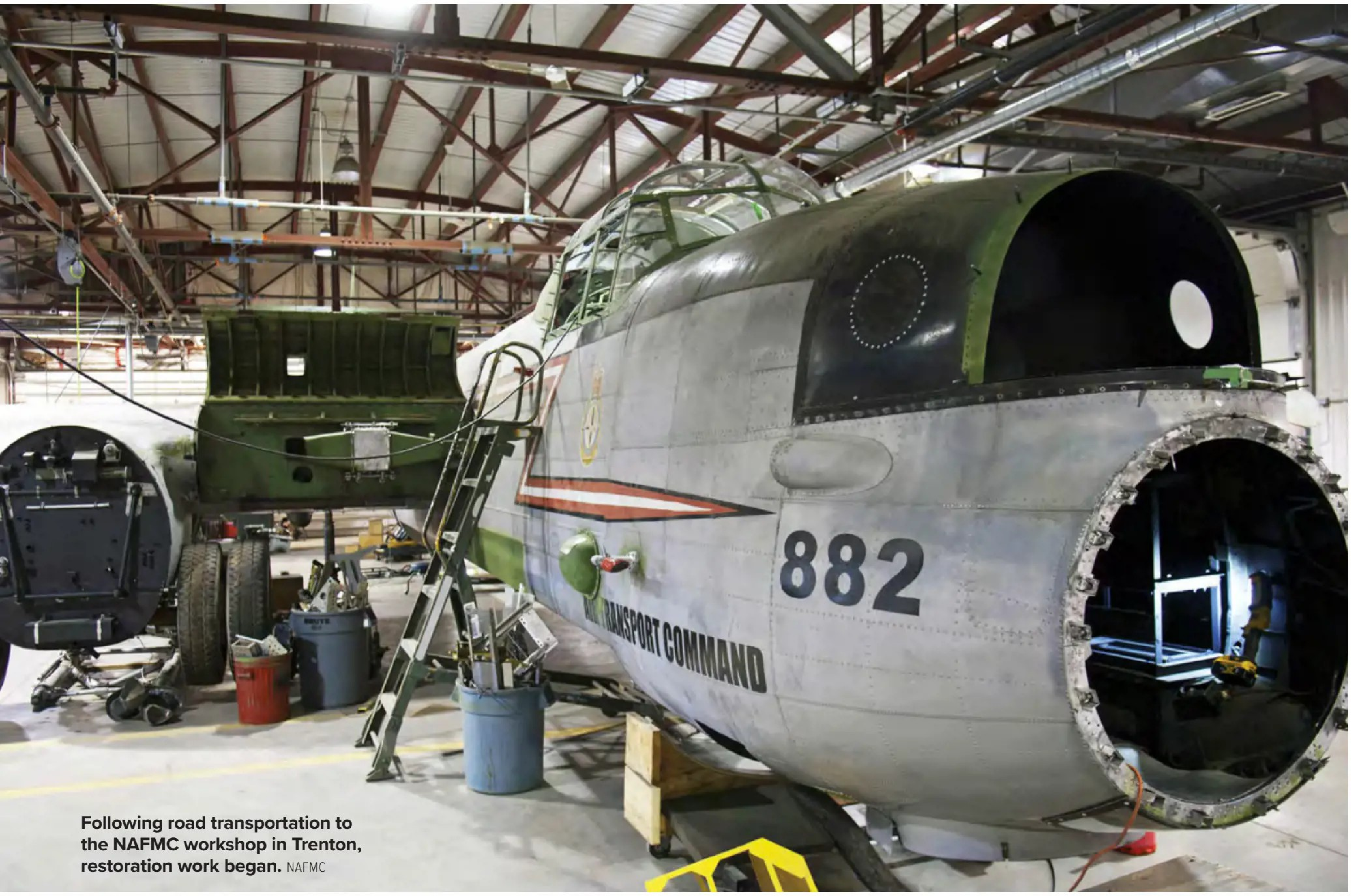
14 July 1964, and KB882 flies over Edmundston, New Brunswick, on its final flight. VIA ALBERTA AVIATION MUSEUM



On outdoor display in Edmundston during the early 2000s. PATRICK CAMPBELL VIA MAM

the Cuban missile crisis. Its second — and final — retirement came in 1964. Fortunate again to survive, it was bought by the City of Edmundston in New Brunswick and spent the next 53 years as gate guardian at the local airfield.

After the Lancaster's donation to the NAFMC and transport to the workshop in Trenton, a thorough assessment of its condition was conducted. Surprisingly, despite decades exposed to the elements, the structure was in very good condition. "A local scout group had shown up every now and then and repainted the aircraft", explains Kevin Windsor, the

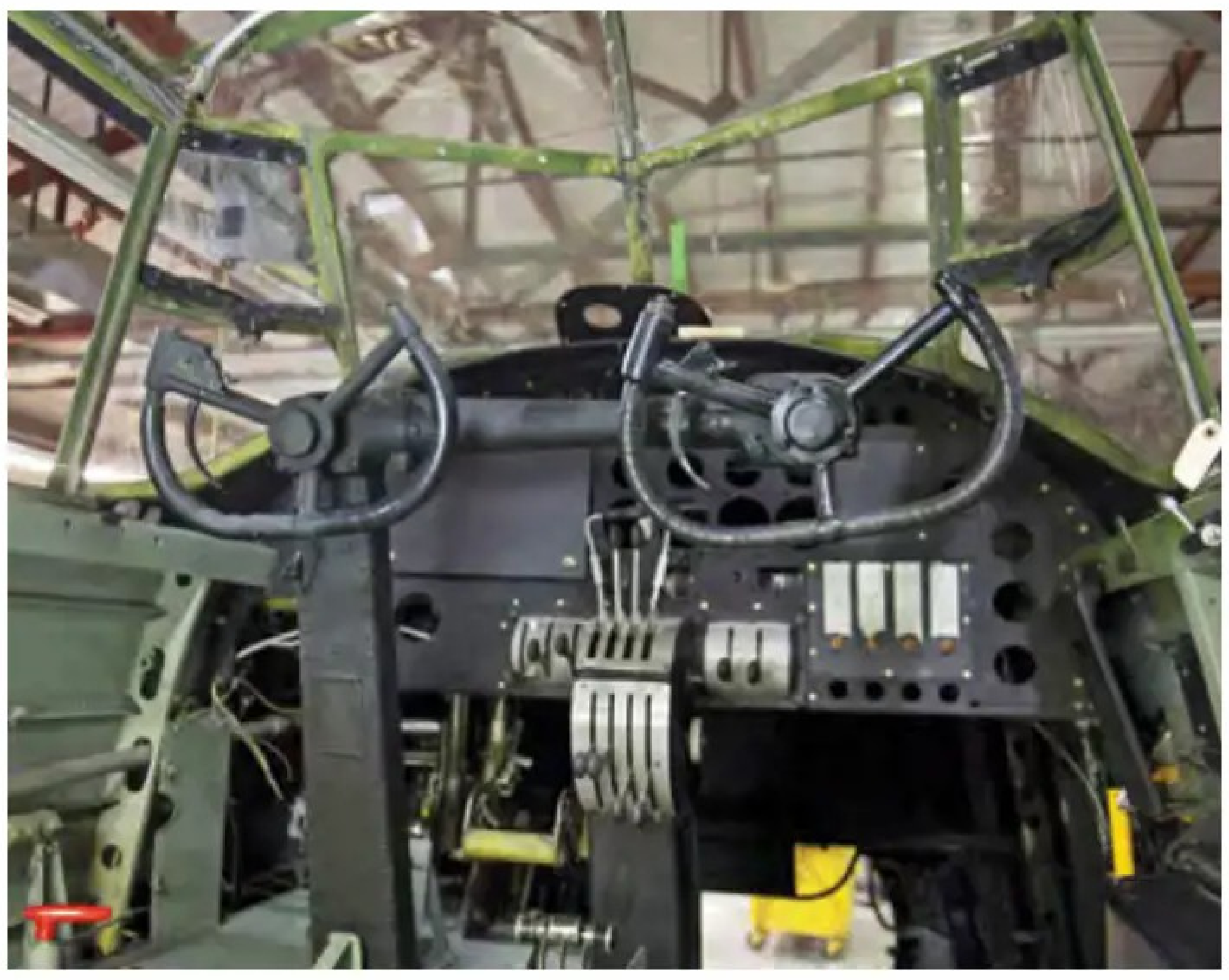


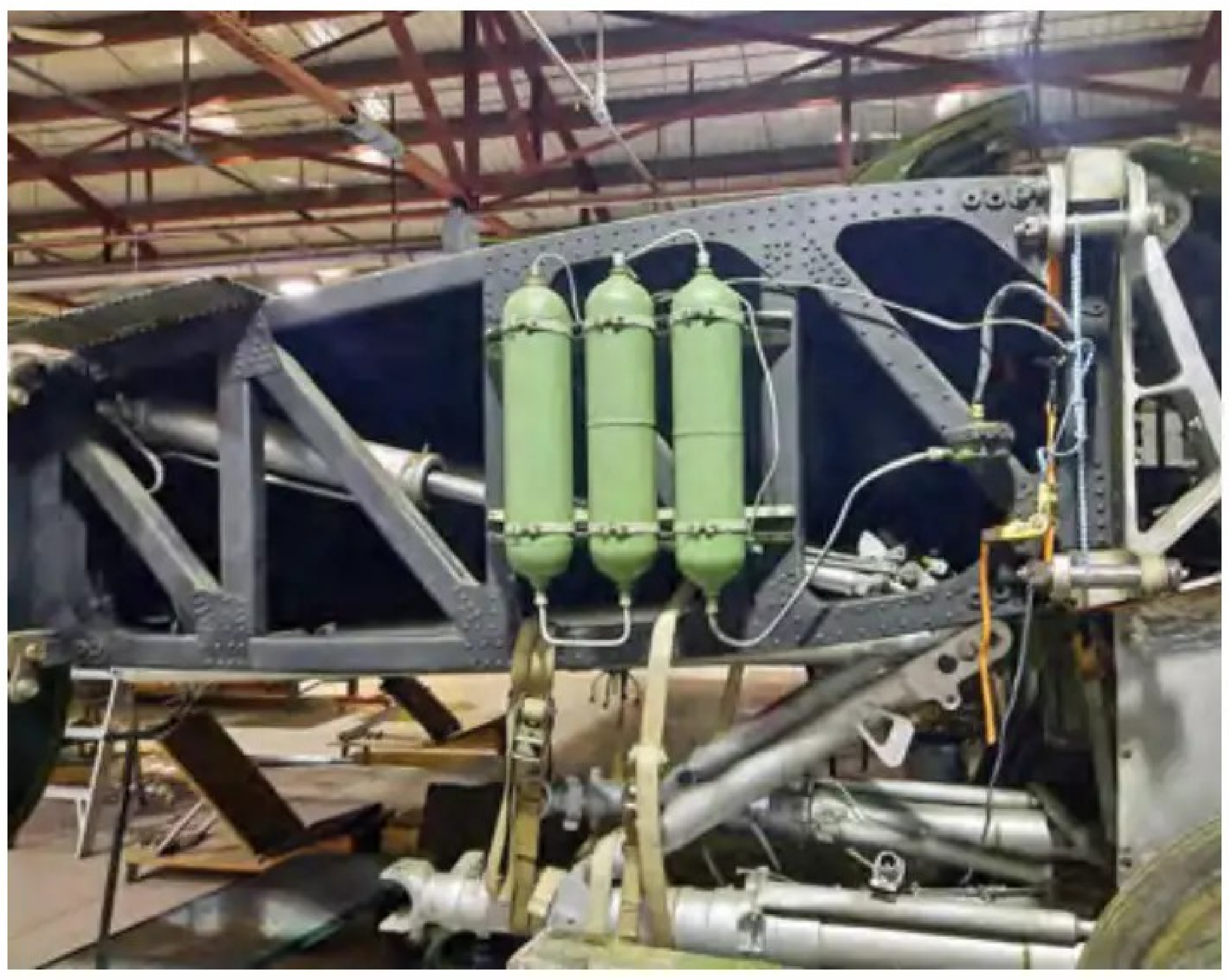
Following road transportation to the NAFMC workshop in Trenton, restoration work began. NAFMC

museum's executive director. "We found eight to 10 layers of paint on it — this basically saved KB882". On the other hand, no instruments and items of equipment were left in the fuselage. The airport authorities had removed some items and handed over a few boxes to the museum, but this amounted to only about 10 per cent of what was missing.

It was therefore decided to split the restoration into two stages with the rough target to have the aircraft externally completed and repainted by 2024, in time for the RCAF's 100th anniversary. After this first stage, the restoration of the interior would follow in the next few years. A group of 20-30 volunteers, led by full-time restoration technician Mike Joly, set to it and has now spent around 60,000 hours on the project, which is — despite a nearly two-year interruption due to COVID — still roughly on track.

Work on the two rear fuselage sections began in early 2018. Due to their good condition, it even proved possible to retain most of the skin panels. Only those below the rear fuselage and on the wing undersides needed replacement. Progress on the fuselage sections was swift, so with transparencies and missing external fixtures replaced, the fuselage was reassembled by 2020 and waiting to go into the paint shop. The team embarked on the wings and the interior, adding walls and flooring and starting to prepare the instrument panels, until





ABOVE LEFT TO RIGHT: KB882 arrived with barely any instruments left. Work is ongoing to complete this and other aspects of the equipment. NAFMC
A partial refurbishment of the interior — including the chemical toilet — will only be finished once the aircraft has returned to Trenton. MAXIMILIAN MEINDL
In the meantime, the internal systems have been refurbished to a high standard. NAFMC

the pandemic caused things to be put on hold. Not until the summer of 2022 was capacity available at the Aerospace Telecommunications and Engineering Support Squadron (ATESS) at CFB Trenton to start treating and painting KB882. This process took until the summer of 2023 to complete.

While this was ongoing, advances were made in relation to the engines, flaps and some internal fixtures. Three of the four Merlin engines proved to be in good shape, too, while the fourth required more attention. All were stripped down, cleaned and rebuilt to a potentially runnable state. The hydraulic system was refurbished and could be workable, although no fluid will be put in. A more cosmetic restoration was performed on the electrical installation, with only damaged fairings and couplings replaced. Where wires and harnesses were missing, such as in the horizontal stabiliser, they were not remanufactured.

> *“It even proved possible to retain most of the fuselage skin panels”*

In parallel, the search for the required equipment was intensified. Donations came in from all over the world for the cockpit instruments, but significant portions of them remain missing. For these, 3D prints will be made and installed as place-holders until an original part can be found. A complete radio set has now been donated and will be added to the aircraft later, along with the cameras. Of these, three are available, but the Mk10(AR) version’s very rare trimetrogon camera has proved elusive so far.

It is noteworthy that it has been decided to keep KB882 in its post-war configuration as it left service in 1964, rather than restoring it to wartime standard. As Kevin Windsor explains, “We wanted to also tell the story

THE COMMISSARY
BAR & CAFÉ

The stylish food court, with the sergeants’ mess in the background. MAXIMILIAN MEINDL

THE ‘LANC’S’ NEW HOME

Built as part of the British Commonwealth Air Training Plan in 1940, what is now known as Base31 owes its survival to a series of lucky developments. The first of these was an error during construction: instead of the planned wooden trusses for its hangars, it received steel trusses initially assigned to another location. After being the home of No 31 Bombing and Gunnery School — from which it took its present name — until 1944, it was assigned to the army and became Camp Picton, mainly housing artillery units until its final closure in 1969 as CFB Picton. Bought by the then mayor of Picton, H. J. MacFarlane, a portion of the site was used to build a hospital while the rest was left dormant.

Upon closure of the hospital, in 1999 the former base was sold to Vivian Scott, a Bomber Command veteran who wanted to preserve it. Different revenue-generating activities were started, including using the surviving buildings as a backdrop for filming World War Two-themed movies. After Scott’s death in 2003, his children decided to keep the site. Run by a local project manager, slowly other activities started to take off. Base31 was finally created in 2021, committing itself to preserve the period buildings while developing into a cultural hub for the area. Thanks to this pledge, Base31 is now the only former BCATP site remaining with most of its original infrastructure still in existence.

Whenever feasible, material such as shingle from buildings beyond repair has been reused to restore others. At the same time, much effort has been spent in designing modern event spaces for a variety of activities, from concerts to escape rooms. Thus, what was the drill hall is now an attractive concert hall for up to 1,500 people, while the former sergeants’ mess contains a bar and a shop offering local wines. Just next to it is a stylish outdoor food court with several lunch options and aviation-themed seating spaces. Families will appreciate the aviators’ garden with 300 native species and the playground, as well as the ice cream parlour in the old dentist’s office. With the site’s museum scheduled to open in 2025, Base31 is an encouraging example of how to preserve an historic airfield as an attractive destination for more than just aviation enthusiasts.

The fully restored Picton sergeants’ mess includes a bar and a small event location. MAXIMILIAN MEINDL

Members of the restoration team in front of the fuselage in the paint shop, with project lead Mike Joly seventh from right and NAFMC executive director Kevin Windsor third from right. NAFMC

of its service during the Cold War, which is often overlooked. If we had returned KB882 to its wartime configuration, the by far bigger part of its service life would have become just a footnote. Therefore, KB882 will become the only fully restored Lancaster in the world displayed in Mk10AR configuration."

By the spring of 2024, the project had progressed sufficiently to reassemble the aircraft at its new home at Base31 near Picton. The link between the NAFMC and Base31 came about rather by accident. As the museum is still fundraising to finance the construction of an extension to house the Lancaster, it urgently needed a place to store KB882 indoors for several years. The mayor of Picton got word of this and contacted the rapidly developing Base31 event location, which had planned to add a museum to its site anyway. An agreement was reached to display the externally complete aeroplane in one of the renovated World War Two hangars, and it was moved there in early 2024. Officially unveiled on 27 June, it can now be visited as part of guided tours.

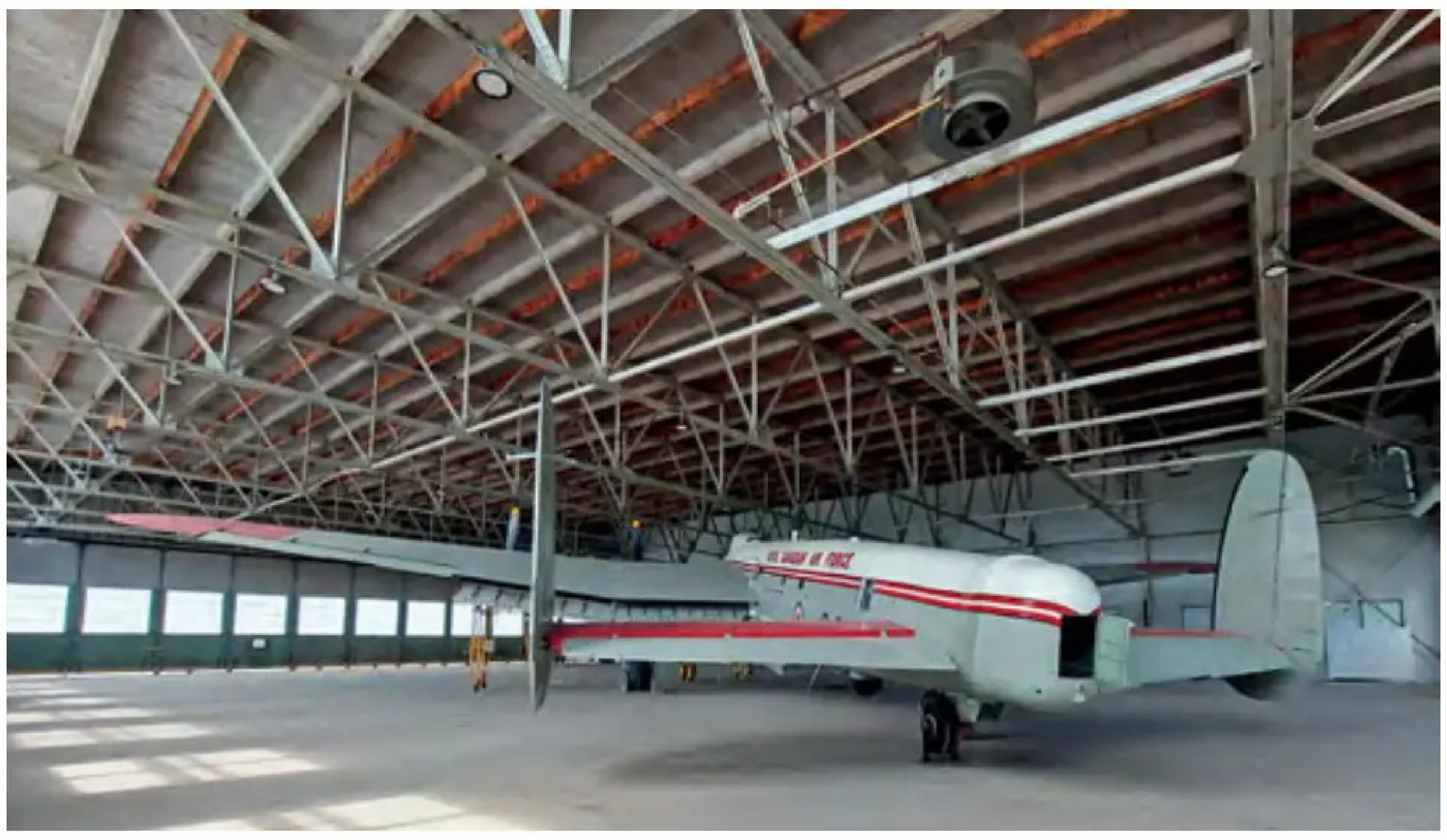
> *"The air force museum is still fundraising for an extension"*

Due to these display arrangements, restoration of the internal compartments has been put on hold. "To keep the artefacts safe, we won't install radios, cameras and further instruments until the aircraft returns to Trenton, probably in 2029", says Kevin. Much stricter security arrangements would have been necessary had these valuable components been placed in the aircraft. The current focus is therefore on collecting the rest of the equipment and finishing the external restoration by adding missing fairings and decals to complete the colour scheme.

Thanks to the NAFMC, within a few years a slowly deteriorating gate guardian has been put under cover and returned to a high display standard. Now KB882's future is secured, completion of its internal restoration is in sight. By then, the NAFMC in Trenton will be the only place in the world where it will be possible to see both a wartime Halifax and a post-war Lancaster in a unique colour scheme.

Should you own relevant parts and want to support the restoration of KB882 by donating them, a list of missing equipment is available via airforcemuseum.ca

During early 2024, KB882 was moved to its temporary display location at Base31 in Picton. NAFMC



Among the modifications to create the Mk10AR version was the faired-over rear turret. MAXIMILIAN MEINDL

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STEVE SLATER

HangarTalk

A vintage light aircraft aficionado's view on historic aviation

Three of the UK's many D-Day-striped Piper L-4s getting airborne for a display at Duxford. BEN DUNNELL

What is the most ubiquitous classic aircraft? Not, even taking into account US registrations, the P-51 Mustang, nor all marks of the iconic Spitfire, or the Tiger Moth, with some 174 currently registered in the UK alone. Outstripping them all, in both its World War Two Piper L-4 artillery spotter form and the 1950s and 1960s Piper L-21, is the humble Cub. They, along with other US liaison types such as Stinson L-5 Sentinels, are the aircraft of choice for many owners and enthusiasts who appreciate flying 'low and slow,' as well as the panoramic views which were common to all 'L-Birds.'

We have to be careful here. Many civilian J-3 Cubs with just 65hp Continental engines and the later PA-18 Super Cubs have gained military liveries in the course of recent restorations. Conversely, a lot of ex-military examples are registered as their civilian equivalents, as well as large quantities of Cubs used in wartime pilot training. By war's end, 80 per cent of all US military pilots had received their initial flight training in Cubs, while during the Allied invasion of France in June 1944 — as it did in other theatres — the L-4's slow speed and low-level manoeuvrability famously made it an ideal observation platform for spotting hidden German guns and armoured vehicles waiting in ambush in the hedgerows of the bocage country, south of the Normandy invasion beaches.

The Cub isn't even the most numerous Piper made. That honour goes to the PA-28 Cherokee, of which some 60,000 have so far been built. I have to say, I am biased. My own Cub, G-ASPS, was acquired from Vintage Aircraft Club stalwart Alan Chalkley and has remained stalwartly civilian since rolling out from the Piper factory in 1948. It was one of the last of the J-3 line and among the final examples manufactured in Piper's 'shadow factory' at Ponca City, Oklahoma. Piper turned out around 8,000 Cubs and side-by-side seat Super Cruisers from the plant, before all post-war Cub production was based at the company's main facility at Lock Haven in Pennsylvania.

Normally hand-swung to start it, the Cub typically has no electric starter, nor indeed any form of electrical system, although one can be retro-fitted. The J-3 or L-4 is distinguished from its successors by having a cowling that exposes its engine's cylinders for more effective cooling in flight. Later, with Super Cub models, the cowling surrounds the cylinder heads, leading to a cleaner appearance and less drag. Another distinctive feature of the J-3 is that it is flown solo from the back seat. Super Cubs usually had an electric start and had the fuel tanks mounted in the wings rather than the forward fuselage, while they are flown from the front seat.

Having a typical take-off speed of 35kt, a stall speed of less than 30 and a cruising speed of around 60, the Cub is generally benign, though it does have some 'gotchas.' As a lightweight taildragger the take-off and landing rolls are inevitably impacted by crosswinds, which leave any Cub trying to simulate a weathervane. With a wingspan in excess of 35ft it can — and will — lift a wing on landing. It's one of the few things about the type that's liable to catch you out. But with such a docile nature and, in the case of the L-4, significant military history, no wonder the aeroplane remains so popular today.

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DENIS J. CALVERT

FlightLine

Recollections and reflections — a seasoned reporter’s take on aviation history

“Distant Frontier is a unit-level training iteration designed to sharpen participants’ tactical combat skills and develop interoperable plans and programs across the joint force”, states the US Air Force. Some 26 years ago, in July 1998, I joined a small — didn’t say ‘select’ — press party accompanying a large RAF contingent which deployed trans-Atlantic to Eielson AFB, Alaska for Exercise ‘Distant Frontier 98’. We routed via Prestwick where, during a short stop-over, we had the chance to walk around the MATS Constellation Group’s C-121A, 48-609/N494TW, which was over on its European tour. This we took as a good omen for our trip.

Unfamiliar surroundings for Tornado F3 ZE207 of No 43 Squadron, airborne out of Eielson AFB, Alaska in June 1998. DENIS J. CALVERT

During the initial briefing to RAF participants at Eielson, Lt Col Jim Carter, boss of the ‘Cope Thunder’ staff, announced, “This is your exercise”. While staged at a USAF base and making use of the 62,000 square miles of Alaskan airspace that was described as “our sandpit” for training, the exercise was organised by the RAF’s Combined Air Operations Centre (CAOC) at High Wycombe. It involved 24 RAF aircraft — 10 Tornado F3s from Leuchars, nine Jaguars from Coltishall plus supporting Hercules, VC10s and a single E-3D Sentry. Additionally, USAF F-16Cs and A-10As from Eielson’s resident 354th Fighter Wing, as well as F-15s from Elmendorf’s 3rd Wing, played their part, particularly on the two days when large composite exercises (COMAOs) were programmed.

The attraction to the RAF of the facilities available in Alaska was evident. This was the 1990s, when the ‘peace dividend’ had resulted in a reduction of defence spending in the UK and what could be seen as a hardening of the attitude of the ‘man in the street’ to being overflown at high speed and low level by a ‘noisy’ RAF fighter on a training sortie. Memories are short. While the Tornado GR1 force had, just seven years earlier, made devastating low-level attacks on Iraqi airfields using the JP233 runway denial weapon in the Gulf War, by 1998 public opinion had increasingly shifted to a belief that the Cold War was a thing of the past and that there was no longer any realistic enemy threat from any direction. The situation in Germany was yet worse. Highly restrictive rules on the military use of airspace meant RAF Germany’s squadrons of Tornados and Harriers had periodically to return to the UK to train to practise and maintain their still-important low-level flying skills. Alaska’s huge military operating areas were subject to far fewer restrictions. They allowed supersonic flying over large areas, unrestricted manoeuvring far away from airways, the use of ECM and the dropping of live weaponry onto realistic ground targets.

Despite a ridiculously low (by UK standards) population density, the sensitivities of Alaskan residents were nevertheless very much taken into account. A USAF briefing officer reminded RAF aircrew that “any collection of three or more buildings” should be considered a township and that “many people in Alaska moved here to avoid people like you and me.”

Everything we saw about the training facilities at Eielson was impressive. Range instrumentation facilitated the recording and scoring of air-to-ground weapon attacks, while the Yukon Mission Debrief System using an aircraft-mounted YMDS pod — underwing on F3, overwing on Jaguar — allowed air-to-air encounters to be recorded in three dimensions and replayed, relived and analysed during the evening’s massed post-flight debriefing.

Deploying this number of RAF aircraft, their supporting personnel and equipment across the Atlantic clearly involved a huge amount of organisation and commensurate cost. Consensus opinion, though, was that the range, scope and realism of the facilities provided, in an exercise area five times larger even than that offered at Nellis, fully justified that effort. Nothing remotely comparable existed — or, indeed, exists today — this side of the Atlantic.

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RICHARD CROCKETT

From the Cockpit

Join one of Shuttleworth's newest pilots on his vintage flying journey

As autumn arrives, the flying display calendar inevitably draws to a close. Still, it's essential for pilots to stay current and be prepared for the next season's start in spring. For several years, I've been fortunate to lead Booker Gliding Club's annual mountain soaring expedition, which takes place at Aboyne airfield, home to the Deeside Gliding Club, nestled in the Dee Valley at the eastern edge of the Cairngorm mountains.

For those unfamiliar with Scotland, the Cairngorms lie at the heart of the Highlands, their granite peaks and plateaus creating a rugged yet majestic environment. In the autumn, they offer perfect conditions for wave soaring — a specialised form of gliding that exploits powerful, invisible currents generated as stable winds flow over mountain ridges. When aligned, these rising waves enable skilled pilots to ascend thousands of feet above the summits, extending flight times and distances beyond what ordinary thermals provide. In many cases, pilots reach altitudes exceeding 20,000ft, soaring at heights typically reserved for commercial airliners.

Soaring in the Duo Discus over the majestic Cairngorms. Flying comes little better than this. RICHARD CROCKETT

Departing from my usual preference for vintage aircraft, the expedition sailplane is Booker's high-performance, two-seat Schempp-Hirth Duo Discus, number 315. Though originally built in the 1990s, it has recently undergone an extensive refit, including a complete repaint and the installation of a modern avionics suite with full blind-flying capabilities. It also now features a cutting-edge electronic demand oxygen system, allowing pilots to climb safely to great heights without risking the onset of hypoxia.

> *"In autumn, the Cairngorms offer perfect conditions for wave soaring"*

Aboyne differs from most gliding sites by offering two tarmac runways — one for take-offs and the other for landings. On a busy morning with ideal conditions, more than 30 gliders may line up at dawn for a launch, yet Deeside's four tow-planes handle this traffic with efficiency and ease.

The aero-tow launch can sometimes be challenging, as turbulent air spills over the nearby hills. However, conditions usually smooth out above 1,000ft. You know you've encountered strong lift when the air becomes silky, and your rate of climb surpasses 1,000ft per minute. This is your cue to release from the tow-plane and soar freely. After releasing and becoming established in the wave, your ascent truly begins. It's vital to remain within the 'wave bar' and avoid drifting downwind, as winds aloft often exceed 50kt. The climb itself is rarely straightforward, and you must steer clear of cloud — at these altitudes, the airframe is well below freezing, and temperatures often fall below -20°C. Once you pass the upper cloud layers, you simply continue applying your mountain-flying expertise, climbing higher still to discover the true extent of these powerful, invisible currents.

Reaching the pinnacle of your climb, it's time to explore. On a good day, the entire Cairngorm range opens up before you, with flights of more than 500km easily attainable. In recent years, pilots have even achieved distances exceeding 1,000km, often taking about nine or 10 hours to complete.

Eventually, the sun begins to sink toward the horizon, and you must keep in mind that descending from high altitude can sometimes take more than an hour. Timing your return to land before sunset is crucial.

Of course, not every day promises perfect flying weather. When Scotland's skies return to their more typical wet and windy disposition, it's an ideal time to explore some of my favourite places, including Loch Muick, Ballater and Braemar. Others seize the moment to scale the Cairngorms' renowned peaks, such as Lochnagar and Ben Macdui. Whatever your chosen adventure, the evenings often conclude in a welcoming pub, surrounded by wonderful friends, as everyone looks forward to the next day's exploits — whatever they may bring.

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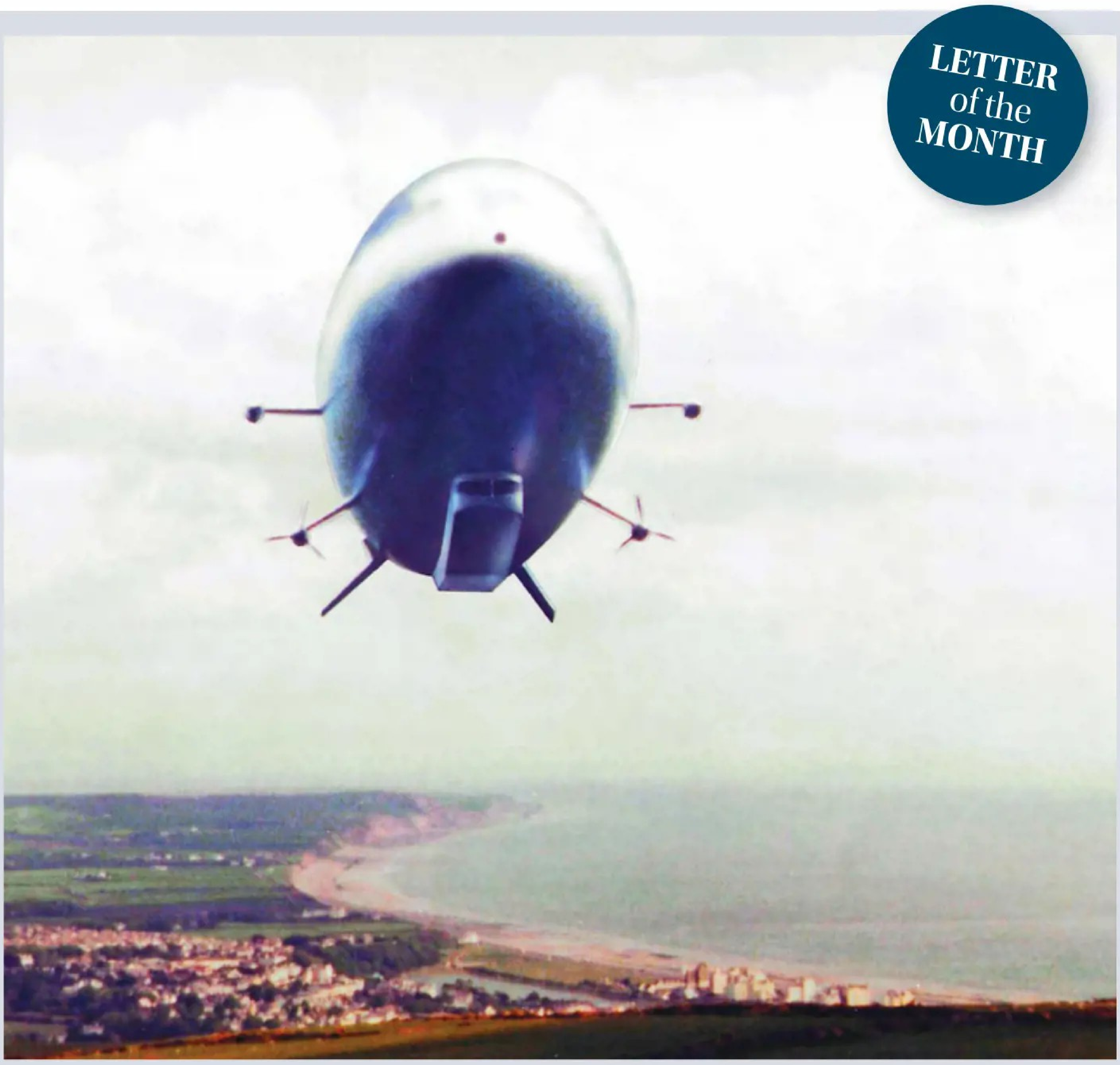
In every issue, the writer of our Letter of the Month wins a **£25 book voucher** to spend with leading military and transport publisher Crécy.

LETTER of the MONTH

I was very interested to read Chris Gibson's article in the December issue about flying battle tanks to a war zone using a Shorts Belfast. From 1980-83 I worked as an aerodynamicist for a company designing airships. It was originally called ThermoSkyships and was founded by Maj Malcom Wren. The firm later merged with Airship Industries, and then split away to form Wren Skyships. Maj Wren's interest in airships started when he was one of those army personnel responsible for brainstorming ideas to transport battle tanks to West Germany in the event of a war with the Soviet bloc. His solution to this requirement was to design an airship for the task but, as mentioned in the article, this military requirement disappeared in the 1960s. However, in the late 1970s and early 1980s there developed a lot of interest in the use of airships for civil and paramilitary applications: transport of large heavy loads, coastguard operations, early-warning radar platforms and so on.

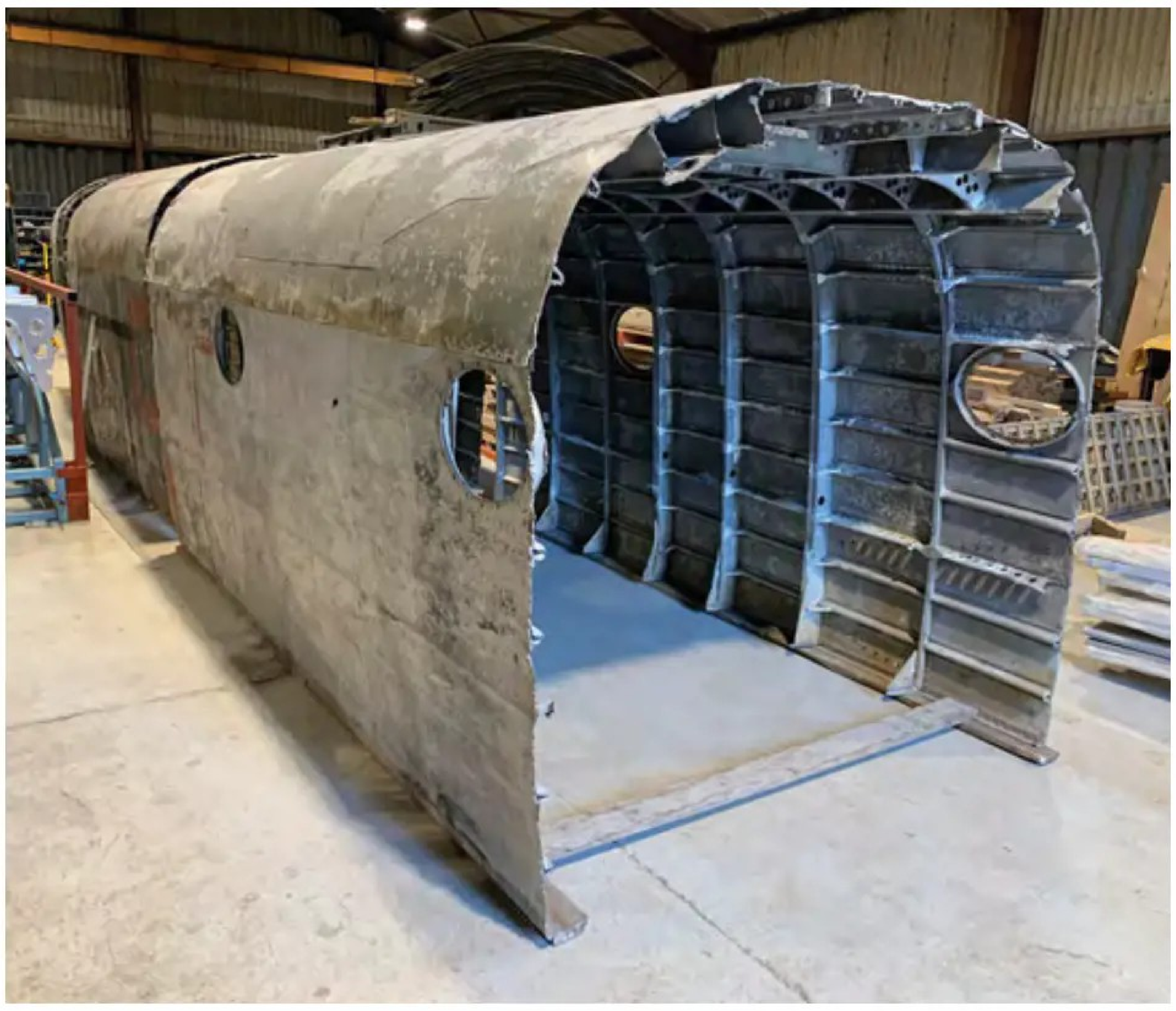

An artist's impression of one of the Wren Skyships designs over Ramsey, Isle of Man.

We produced project designs for several airships. They were all to be pressurised metal-clad rigid airships, inspired by the successful demonstration of the ZMC-2 in the USA — 752 flights from 1929-41. This concept involves the hull having frames and longerons clad in a thin (0.010in) aluminium skin. The hull is helium-filled, and this is pressurised so the skin becomes taut in all directions. The pressure required is very small, about one-quarter psi for a large airship. In this state the hull becomes a monocoque structure where the skin withstands all of the flight loads, but in the unlikely event of a loss of pressure the internal framework can prevent a catastrophic situation, unlike non-rigid airships. We calculated that a 6in hole in the skin of a large metal-clad airship would give plenty of time — several hours — to select a suitable place for a controlled landing, keeping its cargo and occupants safe, before its integrity was compromised.

One of the airships we designed was called the R130. It was to have a volume of 3.9 million cubic feet (111,000 cubic metres), a length of 512ft (156m), a diameter of 120ft (36.6m), and be powered by four vectoring turbo-propeller engines giving it a maximum cruise speed of 98kt (113mph) at altitudes up to 5,000ft. This vessel could carry a 56-ton payload up to 750nm, enough range to take a main battle tank directly to the war zone at a rate of one per day. A fleet of airships could be used, and the ability to carry a tank directly from a UK depot to a front-line depot would maximise productivity. Carriage of a tank as an underslung load would avoid the technical difficulties and structural ramifications of loading and unloading into a cargo bay, and the tank could be delivered 'fuelled-up and ready to go.'

Airships are often thought to be vulnerable to attack, but their configuration provides plenty of scope for the addition of sensors, countermeasures and signature suppression to reduce vulnerability if needed. In this role they would probably not operate close to the enemy and need not be reliant upon any fixed infrastructure, making them mobile and difficult to target.

Nigel Scrase



The fuselage section of Stirling LK142 in the Stirling Aircraft Project's workshop. KEY/BEN DUNNELL

Thank you very much for your excellent and most encouraging Workshop article on the Stirling Aircraft Project in the November 2024 issue of *Aeroplane*. It has given well-deserved recognition, attention and publicity to this project, which has been quietly gathering information and components for a partial rebuild of this extinct aircraft over many years, and which now appears to be experiencing a quantum leap in progress and potential.

The Short Stirling has long been conspicuous by its absence from our national aviation collections, even though it was Bomber Command's first and largest four-engined heavy bomber — taller, deeper and nearly 20ft longer than a Lancaster — with no surviving examples and only fragments of wreckage, and precious few drawings.

Despite the scale of the challenge, there now appears to be a real practical opportunity developing for at least a complete composite fuselage to be created some time in the future — there are no wing sections available for a full rebuild — with the project's recent acquisition of the sections of Stirling rear fuselage from Vraux in France plus wreckage salvaged from the Netherlands. What an impressive exhibit that would be!

At present, the project's focus is on the rebuild of the Stirling nose section, plus a section of the forward bomb bay up to near the wing spar, and this is a large enough challenge in itself. But as more information and more partial wreckage is gathered, and the Stirling Aircraft Project team proceeds along its 'learning curve' to better understand how Short Brothers and its sub-contractors actually put these aircraft together, the prospect of a complete fuselage rebuild becomes ever more possible.

For this greater ambition to be achieved, the article is clear on the important role the RAF Museum could play, contributing its Stirling sections to the overall creation. I sincerely hope such a joint, collaborative effort can be arranged at the appropriate time.

The greatest ambition, I believe, would be for a complete, rebuilt Stirling fuselage to take its rightful place in the Bomber Command hall at Hendon, or elsewhere, putting it in its proper historical perspective alongside the Lancaster and the Halifax. But the first task is to finish the forward fuselage and cockpit area. Hopefully, that awe-inspiring sight will provide the inspiration and impetus to take the rest of the fuselage to completion, and then the Stirling will indeed be back.

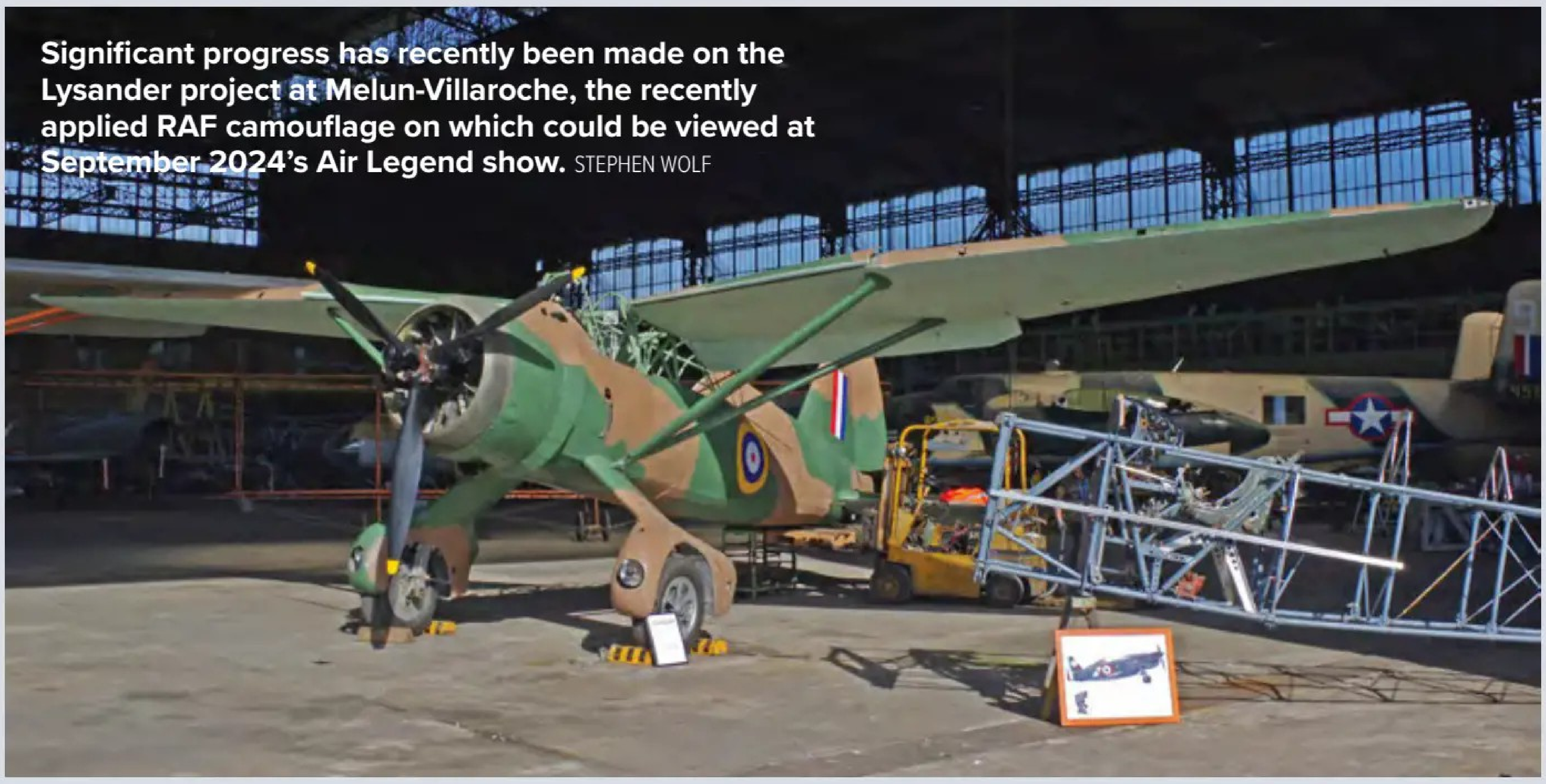
Arnold A. Garside

The August 2024 issue was especially interesting with the special articles on the English Electric/BAC Lightning. I was a US Air Force engineering liaison to the Royal Saudi Air Force back in the early '80s and was fortunate to make many lasting friendships with British crew contracted to maintain the Lightnings. The Lightning was an imposing aircraft and I enjoyed watching the daily training flights. Nick Redfern worked on the electrics and I spent much time in the maintenance hangar observing. Nick even set me up for a ride in the Lightning simulator. An exciting experience, though I crashed on landing approach for lack of fuel!

I was also invited to observe the target range, with the Lightnings blasting away at a concrete target and almost hitting the desert on pull-out. There was a fatal Lightning crash on the same range some weeks later. I still have several projectiles from the 30mm cannon. The shells would burrow through the sand and then land on the surface where they could easily be picked up. Nick was a lifelong friend/mate and passed away just last year.

Lt Col Stan Jonutis USAF (retired)

The editor reserves the right to edit all letters. Please include your full name and address in correspondence.



Significant progress has recently been made on the Lysander project at Melun-Villaroche, the recently applied RAF camouflage on which could be viewed at September 2024's Air Legend show. STEPHEN WOLF

Just caught up with your December edition of *Aeroplane*. Lots of good reading as usual. The Lysander article by David Upton caught my eye, not least because I live in greater Paris. I was sad to learn about the early demise of the Lysander presented to France. However, there is a little-known effort going on south-west of Paris at Melun-Villaroche, with the restoration of an unknown MkIIIa. This Lysander has, like many of the others preserved, an RCAF heritage. I have no idea what the Musée de l'Aviation de Melun-Villaroche has planned for the completed aircraft. But, apart from the one stored at Dugny by the Musée de l'Air et de l'Espace, it's good news that there is another Lysander in France.

Stephen Wolf

Q&A

COMPILER: BARRY WHEELER

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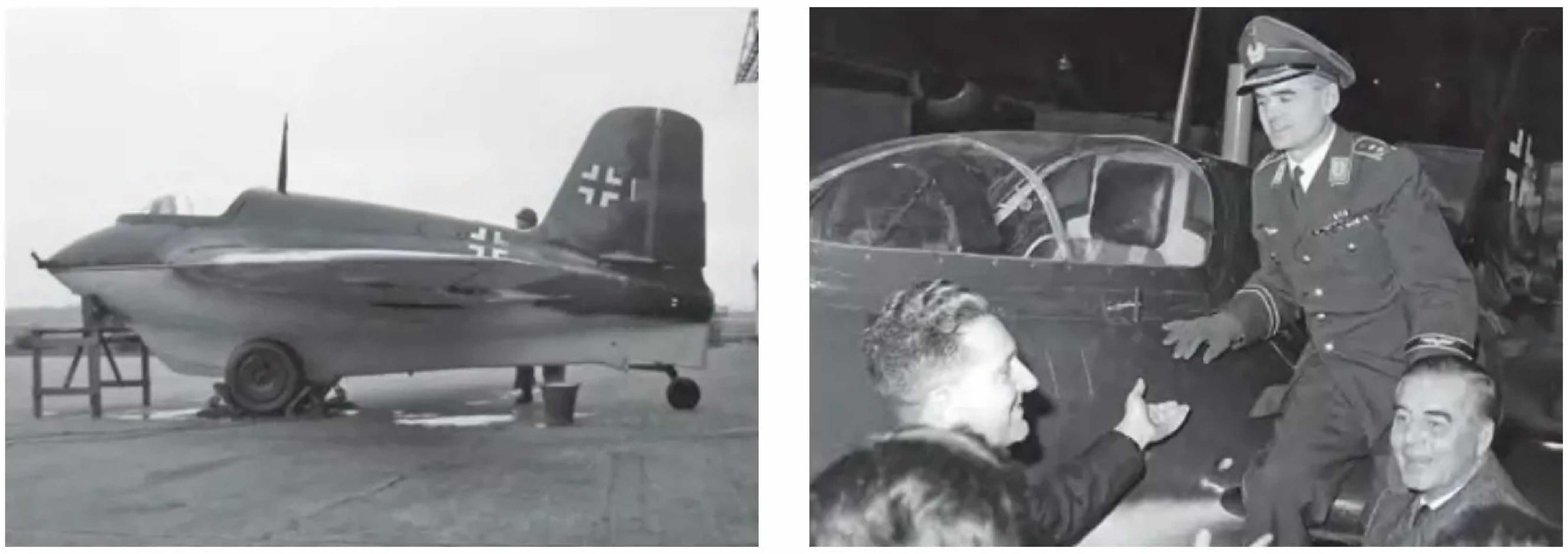
THIS MONTH'S QUESTIONS



Philip Pain's picture of the Biggin Me 163 showing the black cross marking on the fin, and a view taken a few days later at the handover to the Deutsches Museum with wartime Komet pilot Oberst Wolfgang Späte perched on the aircraft with the patched-up centre of the cockpit canopy clearly visible.

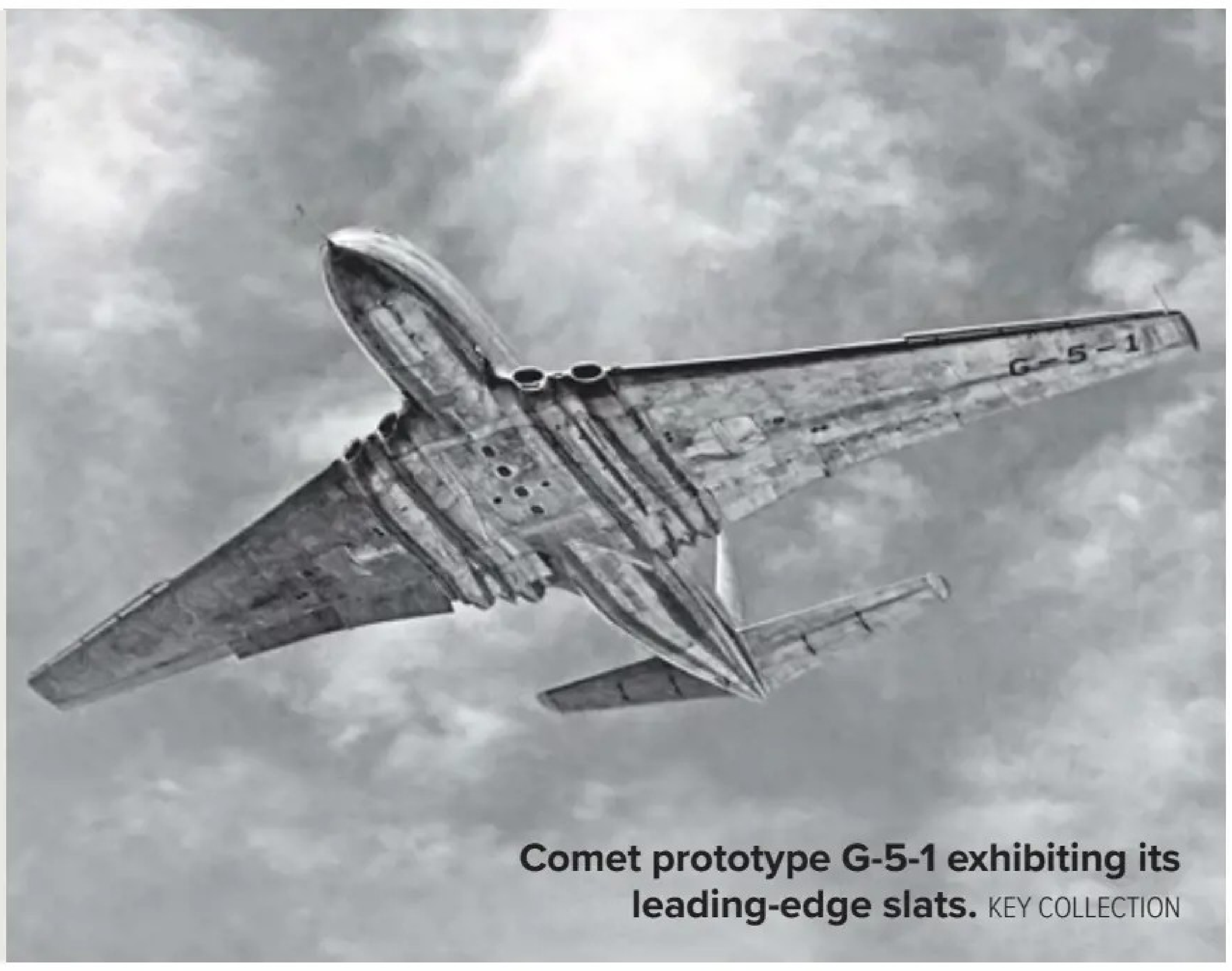
Me 163 to Munich

Q Philip Pain photographed a Messerschmitt Me 163 B-1a Komet at RAF Biggin Hill on 24 November 1964, four days before the aeroplane was officially handed over to the Deutsches Museum in Munich. Your compiler attended the occasion and noted that the Werknummer had been painted over on the lower starboard side of the fin — its usual position — while given the politically charged nature of the swastika, these had been sprayed over and replaced with black crosses. Questions about the markings weren't officially discussed and the event concluded with the rocket fighter being partially dismantled and transported to Munich in a Luftwaffe Nord Noratlas.

Philip is keen to caption his picture, and would like to add the Werknummer, but this has eluded him and various references don't provide the answer. It has been given as 120370, but this is now known to be wrong. Other suggestions are 191309 or 191912. This Komet is believed to have had an operational career with KG 400, and after being brought to Britain it was used for gliding trials, unpowered; it then became a travelling exhibit with the Air Ministry, and during numerous moves to and from displays its identity was lost and/or mistaken for another Air Ministry Me 163 B, number 'AM120'. Also incorrect in the Biggin Hill picture are the aerial behind the cockpit and the control stick, both taken from Spitfires, and the lack of a small quarter-light behind the cockpit. Any help would be appreciated, not least since this is the only surviving Me 163 that has no known identity.

Slatted Comet

Q A photograph of the de Havilland Comet prototype in December's Skywriters pages caught the eye of François Cousineau who noted the outboard slats on the wings, a detail which seems to have escaped previous attention. François says they appear to have been replaced by wing fences on subsequent Comets. Can anyone add details as to why the change occurred?



Comet prototype G-5-1 exhibiting its leading-edge slats. KEY COLLECTION

THIS MONTH'S ANSWERS

Tower of strength

Q In the December issue, Geoff Dobson sought details on the use of a substantial wooden structure which someone suggested was a parachute training tower. Tony Exelby responded in the January edition that it was used for Admiralty testing of outdoor antenna systems connected with QinetiQ and was located at Funtington, West Sussex.

A Subsequently, John Bean e-mailed to say it was a tower of a type originally used for parachute training and known as a 'knacker-cracker.' It gave trainees experience in what it was like when parachuting from the top of the 30ft tower in a full harness, with the final 10ft involving the trainee being caught on a cable which slid them about 30 yards to a full-stop landing. The soubriquet alluded to the discomfort experienced if the leg straps caught as the cable arrested your drop! It is assumed the QinetiQ involvement took place after its use for parachuting.

Union flag error?

Q Mike Barrett took issue last month with the depiction of the Union flag on the nose of a BEA Comet 4B, believing it to be upside-down and requesting clarification.

A Peter Cowlan and Remi Hodister both responded with the long-established order that when positioned on a flat surface, the Union flag should always be displayed with the broadest white section at top left — this side of the flag being the 'hoist side' attached to the flagpole. On a moving object, such as an aircraft, on the port side the flag is displayed normally (as above), while on the starboard or right-hand side the flag is reversed — but not turned upside-down with the broadest white section at the top right. Thus, the Comet was displaying the flag correctly.

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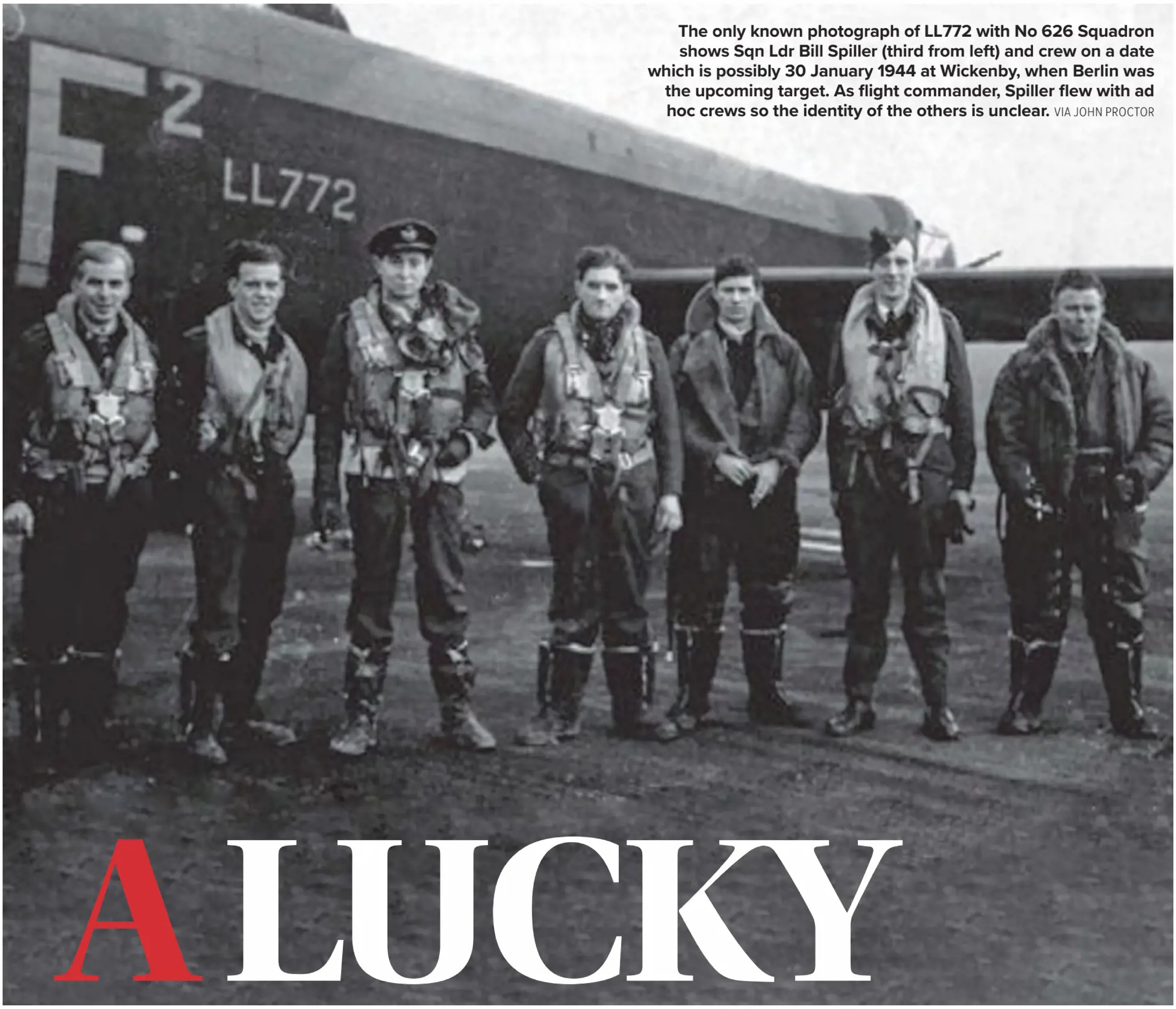


The only known photograph of LL772 with No 626 Squadron shows Sqn Ldr Bill Spiller (third from left) and crew on a date which is possibly 30 January 1944 at Wickenby, when Berlin was the upcoming target. As flight commander, Spiller flew with ad hoc crews so the identity of the others is unclear. VIA JOHN PROCTOR

A LUCKY LANCASTER

The expected life of an RAF heavy bomber during World War Two was low, and from in excess of 7,000 Avro Lancasters produced, just 35 made 100 operational flights or more. Now another can be added to this list

WORDS: IAN SIMPSON

To many, luck and fate go hand in hand, and there's no doubt Lancaster LL772 had its share of good fortune. Apart from the loss of one crew member, this aeroplane was to bring those who went to war in it safely home over 15 months of operational service, while its stablemates led often tenuous existences. Yet it's missing from most listings of the Lancaster centurions.

LL772 was produced by Armstrong Whitworth as constructor's number 239, part of a batch of 350 Lancaster Is. Records reveal it was delivered to No 576 Squadron on 20 January 1944, but just three days later it was sent to No 626 Squadron and would begin operations in the middle of Air Marshal Sir Arthur Harris's Battle of Berlin. 626 was based at Wickenby, just north of Lincoln, under the temporary leadership of Sqn Ldr George Roden DFC. The squadron motto, "To strive and not to yield", could equally be applied to LL772. But how did it reach its milestone?

❶

28 January: Berlin

The aircraft's first operational flight marked a beginning and an end, being the final op of Plt Off Jack Currie DFC's tour. Currie had hoped for an easier target than Berlin for his last trip; nevertheless, LL772 got them safely through.

❷

30 January: Berlin

LL772 now passed into the hands of Sqn Ldr Bill Spiller, the 'A' Flight commander. This former air gunner retrained as a pilot and had prior Lancaster experience with Nos 7 and 625 Squadrons. His first of four trips in LL772 came on the penultimate day of January when he jointly led 12 Lancasters to Berlin, the sixth time the squadron had visited the German capital that month. Spiller's flight was untroubled but Fg Off J. Wilkinson's ME587 was lost without trace and Fg Off Breckenridge's LM584 was attacked four times by a night fighter.

❸

15-16 February: Berlin

February saw an influx of new crews whose captains had their initial taste of operations as 'second dicky' — RAF slang for second pilot — with an experienced crew. Among the seasoned crews was WO Tom Gallagher's, the first to make LL772 'their' Lancaster. Berlin was again on the cards for the night of the 15th and 16th with Gallagher making the first of eight ops in LL772. Added to the crew as 'second dicky' was Canadian Flt Sgt Alex Matheson, who tragically would be lost on his first op as pilot, on 19-20 February. Gallagher's post-raid report read, "Take off 17:32 hours and climbed out over the North Sea to 21,500ft (6,400m) in 10/10th cloud but visibility good above. Over target four hours after take off. Target identified and bombed in third wave. Sky markers [coloured flares such as Wanganui flares] and red target indicators first appeared followed by a good supply of sky markers and green target indicators all close together, one or two target indicators were scattered. The green flare route markers were a good navigational aid. 'Monica' unserviceable. Landed 00:39". 'Monica', incidentally, was an electronic device warning of the approach of night fighters from the rear.

LEFT: The Brazilian-born Sqn Ldr Charles Reade was a flight commander when LL772 arrived at Ludford Magna for service with No 101 Squadron in May 1944. Reade — pictured as a wing commander later in the war — made it 'his' Lancaster and used LL772 on 19 ops. VIA IAN SIMPSON

❹

19-20 February: Leipzig

Spiller used LL772 — with 'second dicky' Canadian Flt Sgt R. S. Bennett — to lead 12 crews to the eastern German city.

❺

20-21 February: Stuttgart

Bennett abandoned this mission over his base as LL772's rear turret gunsight was unserviceable.

❻

24-25 February: Schweinfurt

Feeling a little under the spotlight, Gallagher had his new commanding officer, Wg Cdr Quinton Ross, as 'second dicky' on LL772. Ross's tenure was brief as he failed to return from Berlin on 24-25 March. The Schweinfurt ball bearing factory target had been attacked by American bombers the previous day; now No 626 Squadron added 15 Lancasters to the stream, leaving Wickenby for an eight-hour round trip. There was no cloud and visibility was good as they arrived overhead at 23.13hrs, picking out the target indicators and bombing the centre of the reds from 22,000ft (6,705m).

❽

1-2 March: Stuttgart

The new month began with Plt Off J. Butcher flying LL772 as part of an attacking force of 557 bombers. Thick cloud over Europe and the target meant results were hard to judge, but as a positive the cloud hampered night fighters and only four bombers failed to return.

❾

15-16 March: Stuttgart

In stark contrast to the 1 March Stuttgart raid, losses were heavy this time. Ross led 20 crews, including Bill Spiller who had Flt Sgt H. L.

➔

BELOW: No 626 Squadron Lancasters at one of Wickenby's dispersals in the summer of 1944. Nearest the camera is LL961. R. BENNET VIA ANDREW THOMAS

RIGHT: The predominantly Australian crew of Fg Off Graham Ferriday poses for a group photograph in dispersal at Ludford Magna circa October 1944. This crew made the most operational flights in LL772, at 21.
VIA IAN SIMPSON

Dawson as 'second dicky' in LL772. The route took them across France almost to the Swiss border before turning to approach Stuttgart. Clear conditions aided German night fighters, which brought down 37 of the 863 bombers involved, though No 626 Squadron escaped losses. Spiller landed after being airborne for eight hours 17 minutes, a long, tiring trip and an eye-opener for the new boy.

12

24 March: Berlin

This would have been LL772's fourth visit to the German capital, but Plt Off J. Stewart abandoned his sortie as the engine superchargers failed. Those problems paled into insignificance as Ross and Sgt Margetts failed to return, with no survivors from either Lancaster. Wg Cdr George Rodney took over command.

13

26-27 March: Essen

Again in LL772, Stewart was hoping for better luck as one of 13 crews from No 626 Squadron heading for the Ruhr industrial heartland. After a safe return he reported, "5/10th cloud over target but good visibility, bombed on red TIs and a good glow observed on clouds leaving target". Losses were light on this occasion, at just nine.

14

30-31 March: Nuremberg

This operation proved a disaster for Bomber Command. Pre-arranged for a full-moon stand-down period based on high cloud cover, a last-minute weather report went unheeded and 795 bombers took off. No 626 Squadron provided 16 Lancasters, including LL772 with Plt Off John Butcher. Night fighters attacked the stream from Belgium all the way to the target, resulting in 82 bombers littering enemy territory. A further 13 were lost on the return journey and this night's events went down as Bomber Command's highest loss of the war. Fate intervened and probably saved LL772's crew when an engine failed and they abandoned.

15

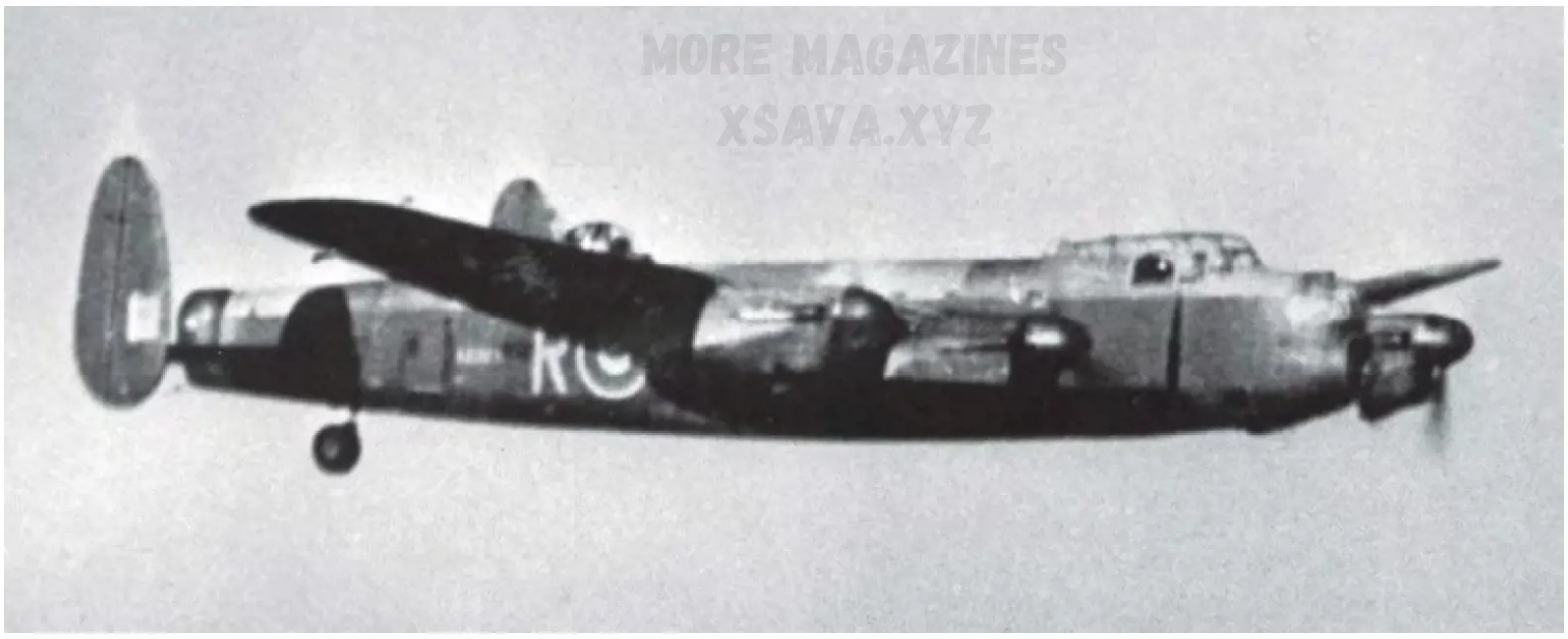
18-19 April: Rouen

At the beginning of April Harris's squadrons changed tack and stepped up attacks on French targets to assist the upcoming invasion of Europe in 10 weeks' time. In LL772's first op of the month, Canadian Flt Sgt Percy 'Jim' Barkway headed for Rouen. Shortly after take-off, brake pressure was lost but they pressed on, bombing successfully.

18

24-25 April: Karlsruhe

Strategic bombing carried on in the run-up to D-Day, targets within Germany continuing to receive attention. Newly promoted Plt Off Gallagher in LL772 was included in the 16 bombers No 626 Squadron committed to attack this city on the Rhine. Post-raid he reported, "Cloud encountered soon after take-off continuing to target, 10/10th cirrus at bombing height, identified target by red and green TIs. Fires well concentrated with one or two scattered incendiaries. A very good attack. Pathfinders very good. Flying through cloud all the time made spotting the markers difficult". A strong wind had blown the markers off-target, limiting damage. The squadron lost three Lancasters as both Flt Sgt Fred Baker (ED424) and WO Victor Bernyk (DV244) fell



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RIGHT: Lancaster 'R' of No 101 Squadron over France in July 1944. This date would make it LL772, but curiously the ABC aerials are not present, presumed removed from the print by the censor, while what can be seen of the serial looks different.
VIA IAN SIMPSON

victim to night fighters. WO Murray McPherson's DV177 was caught near Colchester by a 6./KG 51 Me 410 intruder and came down in flames close to Boxted. There were no survivors from these losses.

ABOVE: **Bremen-bound on 6 October 1944, Fg Off Don Donaldson's crew is about to board Lancaster PB256 of No 101 Squadron. They flew two ops in LL772, including the last of their tour on 9 November.**

DONALDSON FAMILY

⑲

26-27 April: Essen

Another hazard facing Bomber Command crews was ordnance dropped by higher aircraft hitting those lower in the stream — witness this mission. Sqn Ldr J. Neilson led 16 Lancasters, including an uneventful trip for LL772 with Barkway's crew. Despite clear visibility, incendiaries hit two No 626 Squadron Lancasters. Worst-affected was W4990, multiple strikes causing crew injuries and mortally wounding flight engineer Sgt Morris Holmes. Although injured, Plt Off Frank Welford got his crew home and was awarded the Distinguished Flying Cross.

㉑

30 April-1 May: Maintenon

LL772's last successful op with No 626 Squadron was part of a 116-strong force bombing a munitions dump at Maintenon, south-west of Paris. Plt Off Gallagher steadied LL772 at 8,000ft (2,440m) and bombed the centre of fires as directed by the 'master of ceremonies' (master bomber). He noted, "Target one mass of flames with smoke and explosions, one large explosion started a new fire. No flak or fighters."

㉒

1 May: Vénissieux

Gallagher attempted to get LL772 to the Berliet motor works at this location near Lyon, but abandoned over base due to a fuel shortage, jettisoning his bombs over the sea.

After 22 operations LL772 was transferred to No 101 Squadron, commanded by Wg Cdr R. I. Alexander, arriving at its Ludford Magna base on 21 May. There was a delayed introduction to operations as specialised equipment was installed. 101 performed normal bombing duties together with radio countermeasures and supported all major raids. LL772 was fitted with ABC, or 'Airborne Cigar', radio receiver/transmitter equipment operated by an eighth crew member. Known as the special duty operator (SDO), they were German-speakers listening in to German radio messages controlling night fighters and interrupting these frequencies. Among the SDOs were a number of Jewish personnel, some taking Anglicised surnames to hide their origins in the event of capture — the birth name of Sgt John Hereford, part of Fg Off Ferriday's crew in LL772, was Hertzog.

㉓

12 June: Gelsenkirchen

On some nights 101 covered two or three targets with take-off times staggered to optimise protection of the bomber stream. Against this background LL772 began the next chapter of its career in the hands of Sqn Ldr Charles Reade, who led his 17 Lancasters as part of a 303-strong force to the Nordstern oil plant. Reade succinctly recorded, "Bombed red TIs at 01:03hrs from 20,000ft (6,100m)". It was a successful raid but flak and night fighters claimed 17 bombers. For much of the summer LL772 was the personal mount of Brazilian-born Reade, a pre-war RAF officer who joined 101 in April 1944 as a flight commander.

㉗

24 June: Les Hayons

Into the last 10 months of the war, discussion on the direction strategic bombing should take resolved to attack targets satisfying all parties, so oil, transportation and German cities continued to receive attention, as did assisting Allied land operations and the 'V-weapon' sites to counter their attacks on Britain. On 24 June Plt Off Robert Sharp's crew took LL772 to the flying bomb sites near Les Hayons. Soon after crossing the French coast flak engaged the bombers and shrapnel mortally wounded the SDO, Sgt Charles Graves. His predicament passed un-noticed until after the target was bombed. Seeking urgent medical attention for his SDO, Sharp landed at the first available airfield, Selsey, but sadly Graves was beyond help. He became the only member of LL772's crews to be lost in action.

Commonwealth personnel featured prominently on LL772 and it assumed a new identity. Three chiefly Australian crews were to fly LL772, under Plt Off Graham Ferriday (21 ops), Fg Off Syd Gooding (15 ops) and Fg Off Don Donaldson (two ops). The Ferriday or Gooding crew commissioned a large artwork of a kangaroo and joey with the exclamation *Struth!* that appeared under the cockpit.

㉛

4-5 July: Villeneuve-Saint-Georges

No 101 Squadron sent 13 Lancasters to accompany the main force heading for the Villeneuve-Saint-Georges railway yards near Paris, LL772 being present with Plt Off Hubert West's crew. Enemy fighters and flak claimed 11 bombers but none from No 101

ABOVE: Ludford Magna, circa early 1945, and Fg Off Syd Gooding and his predominantly Australian crew — who flew 15 ops in LL772 — are lined up at Ludford Magna. They were fortunate to survive a mid-air collision with another Lancaster over Germany on 29 December 1944. VIA IAN SIMPSON

Squadron, although a Ju 88 attacked Fg Off J. Kinman in DV302 and was claimed destroyed by the rear gunner.

41

31 July: Forêt de Nieppe

The last day of the month saw 101 putting up a double mission. First off in daylight with a fighter escort were 10 Lancasters to bomb the marshalling yard at Joigny; all returned safely although Plt Off Donaldson had a narrow escape from wayward bombs. The second group, headed by Sqn Ldrs Reade, in LL772, and Matthews got away in the dark and made a successful attack on a flying bomb store in the Forêt de Nieppe.

50

18-19 August: Ghent-Terneuzen

Plt Off Ferriday flew LL772's milestone 50th op on 18-19 August, the squadron's second showing of the day. The evening's efforts were split across three targets with LL772 attacking an oil storage facility at Ghent-Terneuzen, Belgium. Ferriday's sortie was uneventful.

52

29 August: Stettin

Reade, in LL772, and Sqn Ldr G. Matthews jointly led 20 Lancasters leaving Ludford on 29 August bound for this German Baltic port supporting the Russian Front. They flew low over the North Sea, avoiding radar detection, then climbed to 18,000ft (5,490m) to pass over the northern tip of Denmark. Across neutral Sweden they were greeted by flak and saw all the settlements brilliantly lit, in stark contrast to blackout Britain. Bombing was judged good with spreading fires, and a pall of smoke rose to 14,000ft (4,270m). It had been a long, tiring flight, averaging nine hours, and on return there were three empty dispersals, all victims of night fighters with just one survivor.

60

16-17 September: Hopsten

In early September Reade was tour-expired, having flown 19 ops in LL772, and 'his' Lancaster now passed to Fg Off Graham Ferriday. This night saw No 101 Squadron dividing its efforts over various German-held airfields — LL772 with Ferriday was one of seven Lancasters attacking Hopsten in North Rhine-Westphalia, Germany. It deposited 20 500-pounders on the target. Other Lancasters targeted three further aerodromes in the Netherlands and Germany. These attacks were in preparation for Operation 'Market Garden,' the Arnhem landings the next morning.

61

17 September: Walcheren

Another raid connected with 'Market Garden,' to bomb flak positions on the island of Walcheren in the Scheldt Estuary, again with Ferriday in LL772.

62

19-20 September: Rheydt

No 101 Squadron sent 10 Lancasters to this German town. Ferriday in LL772 deposited one 4,000lb (1,820kg) and 14 500lb (227kg) bombs on green TIs, noting scattered fires in what was a routine sortie for his crew. This night, however, is remembered for the loss of the master bomber, Wg Cdr Guy Gibson VC DSO* DFC* of dams raid fame.

RIGHT: Australian Fg Off Don Donaldson flew LL772 on two occasions, including the last of his 33-op tour with No 101 Squadron when he took it to Wanne-Eickel on 9 November 1944. Back in Australia, on 27 February 1947 he and his wife Joan were photographed at the ceremony to present his DFC. DONALDSON FAMILY

ABOVE: **New blood: Fg Off 'Howie' Henn and crew beside a No 101 Squadron Lancaster shortly after arriving at Ludford Magna in December 1944. They were the last crew to make LL772 'their' Lancaster and completed 19 ops in the aeroplane.**

RAY PHILLIPS

63

23 September: Neuss

With the Ferriday crew resting, Canadian Fg Off Jim Simpson's crew made their only flight in LL772, taking it into the Ruhr to target a railway junction near Düsseldorf. It was a nightmare trip as cloud completely obscured the target and no markers were visible. Accurate bombing was impossible; some crews identified Düsseldorf via their H2S radar and bombed there. The attack was marred by Lancaster NF982 colliding with another and falling away into the sea, leaving no survivors from Fg Off John Mackie's crew.

69

28 October: Cologne

At the end of October LL772 featured in three Cologne raids. This one, with Ferriday, saw perfect flying conditions and a successful attack with smoke rising to 10,000ft (3,050m). The good weather broke and on crossing the English coast many aircraft ran into fierce cumulonimbus cloud that caused severe icing and violent airframe shuddering until warmer air was reached at 4,000ft (1,220m).

71

30 October: Cologne

Fg Off Donaldson found the target cloud-covered and bombed on Wanganui markers. This was a nervewracking sortie owing to the brightness of the moon being perfect for enemy night fighters. Fortunately there were no losses.

72

31 October: Cologne

Poor weather persisted throughout this trip for Ferriday, who encountered conditions much the same as the previous night and again bombed on Wanganui. No 101 Squadron sent off 71 Lancasters, and for once there were no losses.

75

6 November: Gelsenkirchen

Dual milestones were celebrated as the Ferriday crew completed their tour with the 75th op for LL772. The target once more was in the Ruhr, oil refineries this time. It was an easy finale, as daylight raids often were at this stage, and bombing appeared concentrated. Graham Ferriday — whose DFC was gazetted in February 1945 — and his crew achieved the most operational flights in LL772, totalling 21.

76

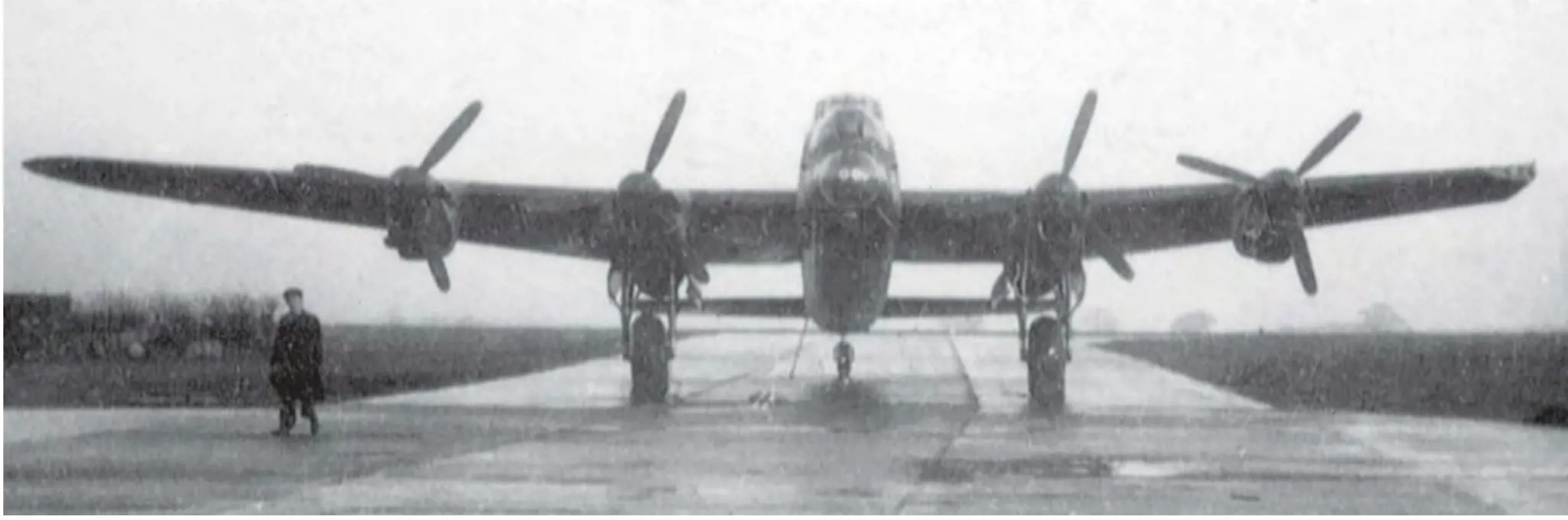
9 November: Wanne-Eickel

In the space of three days another crew completed their tour as Fg Off Don Donaldson took LL772 to the oil refinery at Wanne-Eickel, north-east of Essen. It was fitting LL772 was part of getting these crews safely through, as firm friends Ferriday and Donaldson had trained together in Canada and the UK. Donaldson's diary entry records his emotions: "Much to my joy, a Battle Order came out for a daylight trip. Briefing was early about 9 o'clock and once again, our target was in the Ruhr, Wanne-Eickel — slap in the centre. This was my last trip of 33 and the thirteenth over the Ruhr. Took off about 12 o'clock and soon after leaving the coast, ran into a front, with 10/10th cloud extending up to 20,000ft (6,100m). I was only at about 14,000ft (4,270m) and had to climb up through it. We managed to make it but the stream was bad and icing heavy. The target was cloud covered and we bombed on 'Gee.' The defences were very heavy but fortunately we managed to get clear of the target without trouble. Flew through heavy cloud again coming home and were badly iced over Belgium. Landed base about 4.30 and we received a shower of congrats from our ground staff and friends. What a day!" In March 1945 DFCs were confirmed for Donaldson and his navigator Fg Off Barry Ainsworth.

90

29 December: Scholven

The mantle of taking LL772 forward into the last year of the war now fell to another Australian crew, under Fg Off Syd Gooding, but events would not always run smoothly. The risk of collision in the bomber stream was ever-present as hundreds of aeroplanes converged on the target. LL772 had a lucky escape in the darkness on this night when the objective was the Scholven oil refinery in Gelsenkirchen. Gooding's account reads, "We headed out into the approaching night and about 20 minutes from the target Sgt J. Kilgallen, our engineer, pointed to an aircraft exactly parallel to us, same height and pacing us perfectly, then slowly converging towards us. I decided to drop 200ft (60m) and adjusted the auto pilot when the engineer slapped me on the shoulder. I looked up and this aircraft had commenced a 'corkscrew' manoeuvre and was hurtling towards us. I instinctively went with him in perfect shadow formation. We were underneath and I feared our props would tangle,



ABOVE AND ABOVE RIGHT: The day after its collision with another Lancaster over Germany on 29 December 1944, a sorry-looking LL772 sits in its No 101 Squadron dispersal at a bleak Ludford Magna. The officer is thought to be Plt Off John Rebbechi, the mid-upper gunner who had a grandstand view of the incident. VIA IAN SIMPSON

then somehow either he slipped in or we skidded out and as we parted raked him right across from the port inner engine, bomb bay and the starboard engines. We lost about eight feet from the port wing tip and found later his starboard outer had sliced about six feet off our leading edge. Regaining level flight and confirming the old bus reacted alright we pressed on, bombed and got back home". Gooding was awarded an immediate DFC for his coolness on this occasion and his high degree of skill and bravery thus far in his tour. Damage to LL772 was assessed as Category AC (repairable on site) and work was completed by Avro personnel from Bracebridge Heath in the coming days.

91

28 January: Stuttgart

On into the New Year, it was time for a change as Wg Cdr Ian Gundry-White, a former No 101 Squadron flight commander, became the unit's final wartime CO on 21 January. LL772 made its first sortie of 1945 on 28 January with regular skipper Syd Gooding taking along Fg Off Ted Ridler RAAF as 'second dicky'. The main emphasis of Bomber Command's efforts in February and March were the Ruhr and Rhineland ahead of the advancing Allied armies.

92

1 February: Ludwigshafen

The penultimate operation of the Gooding crew's tour was in LL772, and acted as a graphic illustration of just how lucky they had been just after Christmas. Some 15 minutes before reaching their target two of the squadron's Lancasters, JA715 and ME863, collided and fell away to earth near Sornéville in German-occupied France — there were just two survivors. To add to this misery, New Zealander Fg Off Robert Clark's PB256 was shot down by a night fighter and all eight who were on board perished.

93

2 February: Wiesbaden

The Gooding crew completed their 31-op tour, fittingly in LL772 — their 15th sortie in her. Wiesbaden was obscured by cloud and thus many industrial targets survived unscathed.

95

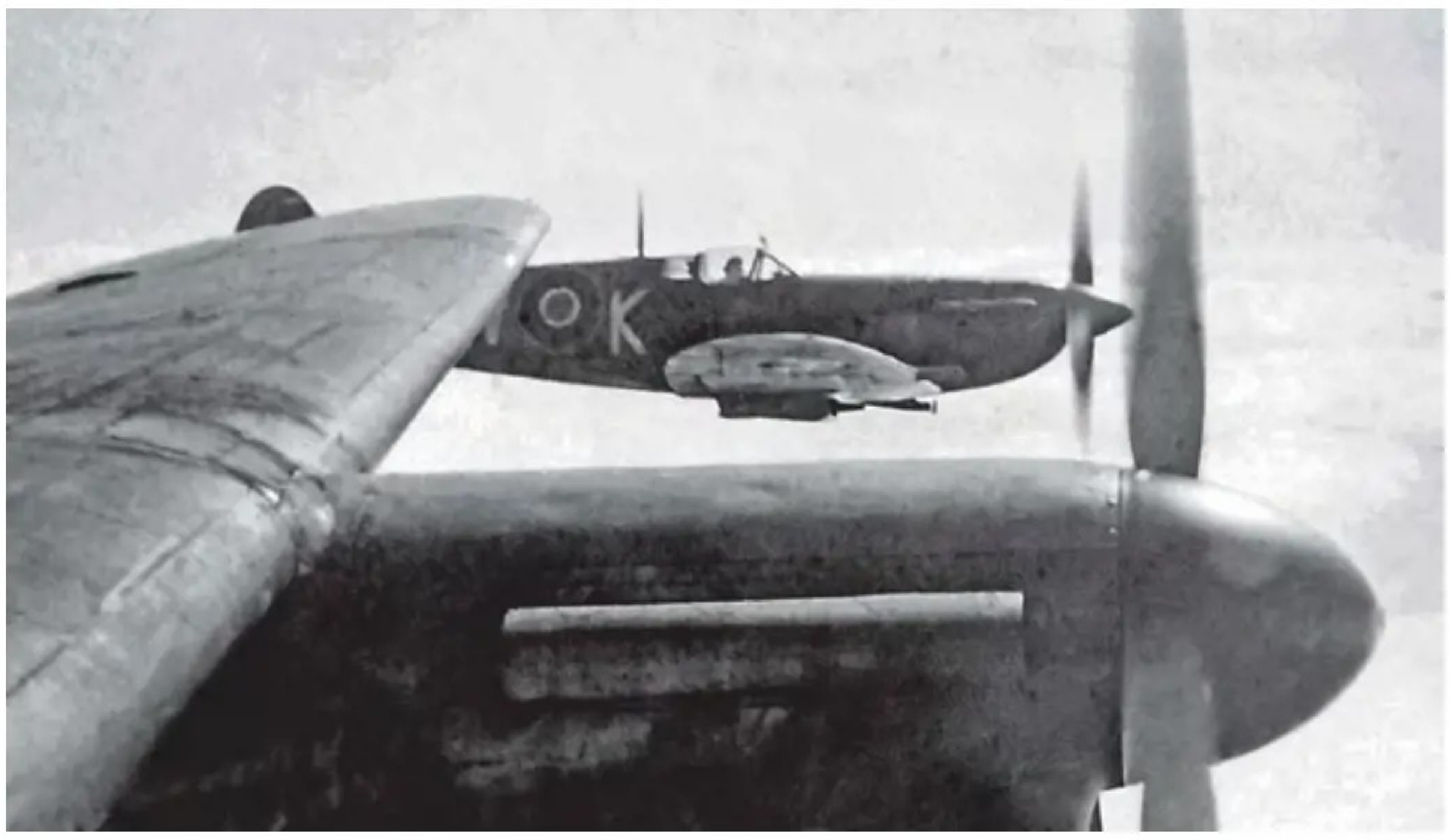
7-8 February: Kleve

From February LL772 took on its last regular crew comprising four Canadians and three Britons plus a Canadian SDO, with skipper Fg Off Howard 'Howie' Henn. LL772 would take part in a further 28 bombing sorties before cessation of hostilities, with the Henn crew completing 19 of these. Their first was when the night's target was Kleve, a German town on the Dutch border, preparing the way for the British XXX Corps offensive. Bombing was below cloud level at just 4,500ft (1,370m) and LL772 sustained flak damage when shrapnel smashed the H2S housing.

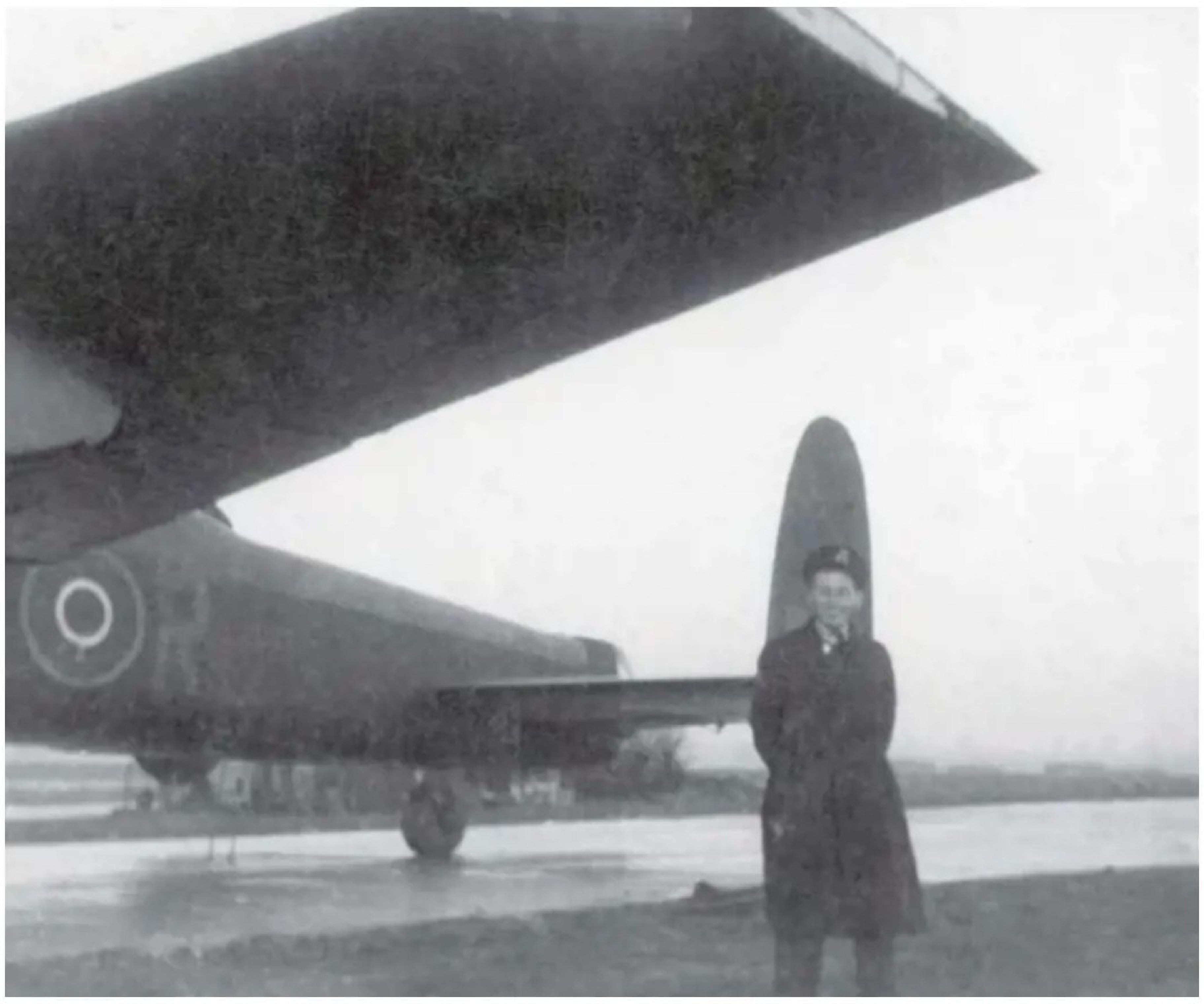
96

13-14 February: Dresden

This 10-hour drag was part of Operation 'Thunderclap', a series of raids on German cities hoping to collapse the Nazi war machine and civilian administration, thus bring closure to the war. Outbound, LL772 lost an engine and was unable to get above 15,000ft (4,570m). The bombing created a firestorm that ravaged much of the city, sparking post-war controversy over the moral validity of bombing non-military targets so late in the war. LL772 took part in a further 'Thunderclap' raid the next night, bombing Chemnitz, and returned there on 5-6 March. The latter occasion proved costly as 37 bombers were lost.



RIGHT: Not all LL772's flights were of an offensive nature, as this early 1945 photograph shows. During a fighter affiliation flight over the Channel, one of Fg Off 'Howie' Henn's crew snapped a Spitfire V as it takes a break from the exercise and flies in formation with the Lancaster. RAY PHILLIPS



100

23-24 February: Pforzheim

'Howie' Henn may well have approached this operation with trepidation as it marked his 13th op, but for LL772 it was a significant milestone: its 100th mission. There was an abundance of night fighters and losses amounted to 11, including two from No 101 Squadron. LL772 was lucky not to be included when a wayward Lancaster narrowly missed colliding with it. Another loss was the master bomber, Capt Edwin Swales of No 582 Squadron, who for much of the raid directed it from a damaged aircraft and steered his crew to safety, but was killed when the Lancaster crashed. His Victoria Cross was the last awarded to a Bomber Command aircrew member.

104

7-8 March: Dessau

In the hands of Henn, LL772 lost an engine and could not keep pace with the stream, so bombed the secondary target of Solingen. On returning they learned Sqn Ldr Monty Gibbon had failed to make it home and the Henn crew had lost one of their number as the SDO, Sgt Rudy Mahr, had volunteered to make up Gibbon's crew.

105

8-9 March: Kassel

In a change of crew LL772 was entrusted to Flt Lt Harold Meadows. On the outward flight an engine failed, but undeterred Meadows pressed home a determined attack and safely regained base, receiving a DFC for his skill and determination.

106

11 March: Essen

Even at this late stage of the war the RAF showed no sign of easing attacks on German cities; witness this night when Essen received the attention of 1,079 bombers, the largest number thus far. LL772 was included and flown by the Henn crew.

108

13-14 March: Gelsenkirchen

Again the Henn crew partnered LL772 as part of No 101 Squadron's contribution to a main force totalling 195. Climbing out through cloud that cleared over Germany, heavy flak greeted them as they bombed a benzol plant and their leader's Lancaster suddenly exploded after a direct flak hit. There were no survivors from Sqn Ldr Ian MacLeod-Selkirk's crew. Among them was 19-year-old Flt Sgt John Toy who had volunteered to make up the numbers. He was formerly the SDO for Fg Off Gooding.

110

16-17 March: Nuremburg

Nuremburg's last heavy Bomber Command raid. German night fighters picked up the stream on its way in and losses amounted to 25 Lancasters. Yet again LL772 suffered an engine failure, returning on three.

113

23 March: Bremen

New Zealander Fg Off Alex Benton took LL772 as part of a daylight raid on bridges and successfully unloaded 11 1,000lb (455kg) bombs into the smoke of previous attacks. Two of the squadron's Lancasters failed to return; these were destined to be its last casualties. None of Fg Off Ralph Little's crew survived from DV245, making its 119th sortie, while only three escaped from LL755. This left DV302 and LL772 as No 101 Squadron's 'grandes dames', both ultimately achieving 121 operational flights.

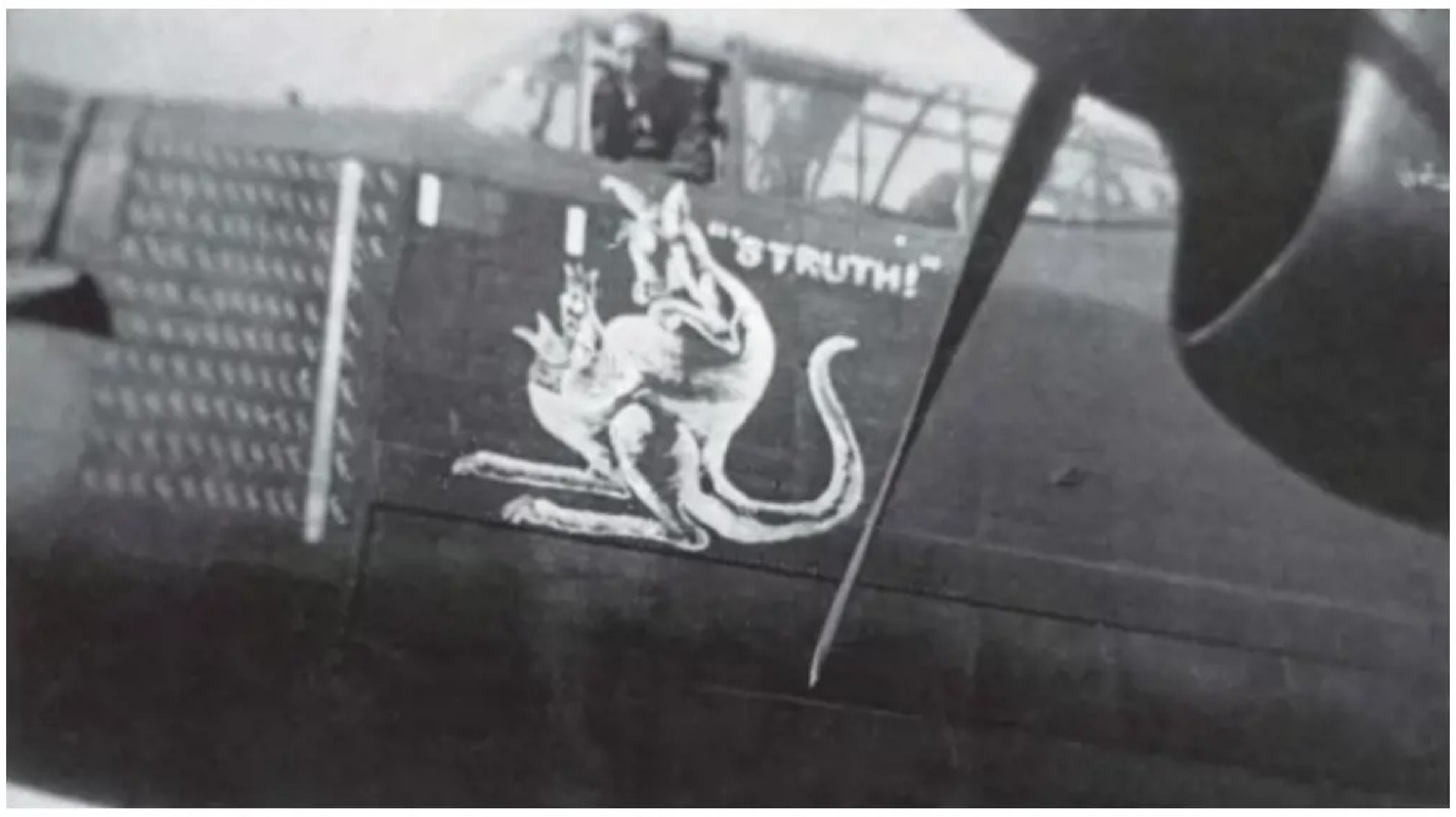
116

3 April: Nordhausen

It had taken seven months for Flt Lt Hubert West to recover fitness after sustaining a serious leg wound. With three previous sorties in LL772, he returned to its cockpit in a raid against the barracks and town of Nordhausen. Cloud obscured the drop point so they bombed between two H2S-equipped aircraft. Engine problems on the return leg meant West opted to land at advanced landing ground A89 at Le Culot (Beauvechain), Belgium.

BELOW: A Lancaster silhouetted against conflagrations in the target area while other pyrotechnics leave momentary traces in the night skies of Germany. As shown, aircraft stood out over the fires on the ground, aiding visual location for the German night fighters, while the Germans also deployed flares, dropped above the bomber stream, as a location aid.

VIA IAN SIMPSON



RIGHT: The nose of LL772 on completion of its service with No 101 Squadron in May 1945, a smiling Fg Off 'Howie' Henn looking on from the cockpit. Immediately under the cockpit glazing, an RAF long-service medal ribbon has been painted recognising 121 operational flights, recorded by small kangaroo motifs. In continuing a strong Australian association to this bomber, a large kangaroo and joey emblem with the exclamation *Struth!* were applied. VIA IAN SIMPSON

117

9-10 April: Kiel

Bomber Command turned its attention toward the U-boat yards at Kiel and elements of the Kriegsmarine in the harbour area, dispatching 591 Lancasters including 30 from No 101 Squadron led by the CO Wg Cdr Ian Gundry-White. Henn was at the helm of LL772, arriving over the target in heavy flak and releasing the load onto green target indicators from 20,000ft (6,100m). This crew reported how the heavy cruiser *Admiral Scheer* blew up shortly after their attack and ultimately capsized. The heavy cruiser *Admiral Hipper* and light cruiser *Emden* were damaged.

119

14-15 April: Potsdam

Thus far LL772 had avoided the attention of night fighters, but this was rudely ended during the last major Bomber Command raid on a German city. LL772 had the usual Henn crew aboard for this nine-and-a-quarter hour flight. Over the target they were coned by searchlights and subjected to flak. Entering an evasive 'corkscrew' the Lancaster was attacked by a Bf 110. With the situation looking grim, salvation came as the night fighter blundered into the searchlight beams that were promptly switched off. The flak stopped and LL772 made good its escape.

120

18 April: Heligoland

A variety of targets presented themselves, including a naval base, airfield and village all on Heligoland, a small archipelago in the North Sea off the German mainland. This was by far the heaviest raid on the island: 969 bombers including LL772. As the Henn crew turned away, there was little doubt of the devastation wrought below and the island was evacuated the following day.

121

22 April: Bremen

In what was LL772's final operational flight, 767 aircraft were dispatched for a raid in preparation for an attack by the British Army two days hence. It was to prove an anti-climax as after a quarter of the force had bombed, the master bomber called off the remainder as cloud, smoke and dust obscured the target. For the Henn crew it was their last op in LL772 and the penultimate bombing sortie of their tour.

LL772's last role of the war was a humanitarian one in Operation 'Manna'. The western area of the Netherlands was still under German control with its civilians facing starvation. A truce was brokered, and between 29 April and 7 May food was air-dropped to the Dutch in 2,835 Lancaster sorties, three of these by LL772: on 1 May to Rotterdam, 2 May to The Hague and 3 May to Rotterdam again.

Now one of 101's oldest Lancasters, LL772 was deemed surplus to requirements and on 10 May 1945 it was flown off to No 46 Maintenance Unit at Lossiemouth. There it languished until 15 January 1947 when, without thought or ceremony, the machine was struck off charge and reduced to scrap.

During 15 months of operations, LL772 was flown by 31 crews on 121 operational sorties, 61 per cent of which were by just four crews — Ferriday 21, Reade and Henn 19 each, and Gooding 15. It had survived night fighter attacks, flak, adverse weather and collisions. At least 18 gallantry awards were earned by its aircrew. Apart from one fatality it brushed adversity aside and brought its crews safely home. Of the 18 Lancasters with serials LL750-LL779, 11 were issued to No 101 Squadron and only LL772 survived operations. Was this luck or fate? Judge for yourself.

RIGHT: A fuel bowser is parked alongside LL772 as it is refuelled following its 120th op to Heligoland on 18 April 1945. At this stage of the war the ABC aerials appear to have been removed. VIA IAN SIMPSON

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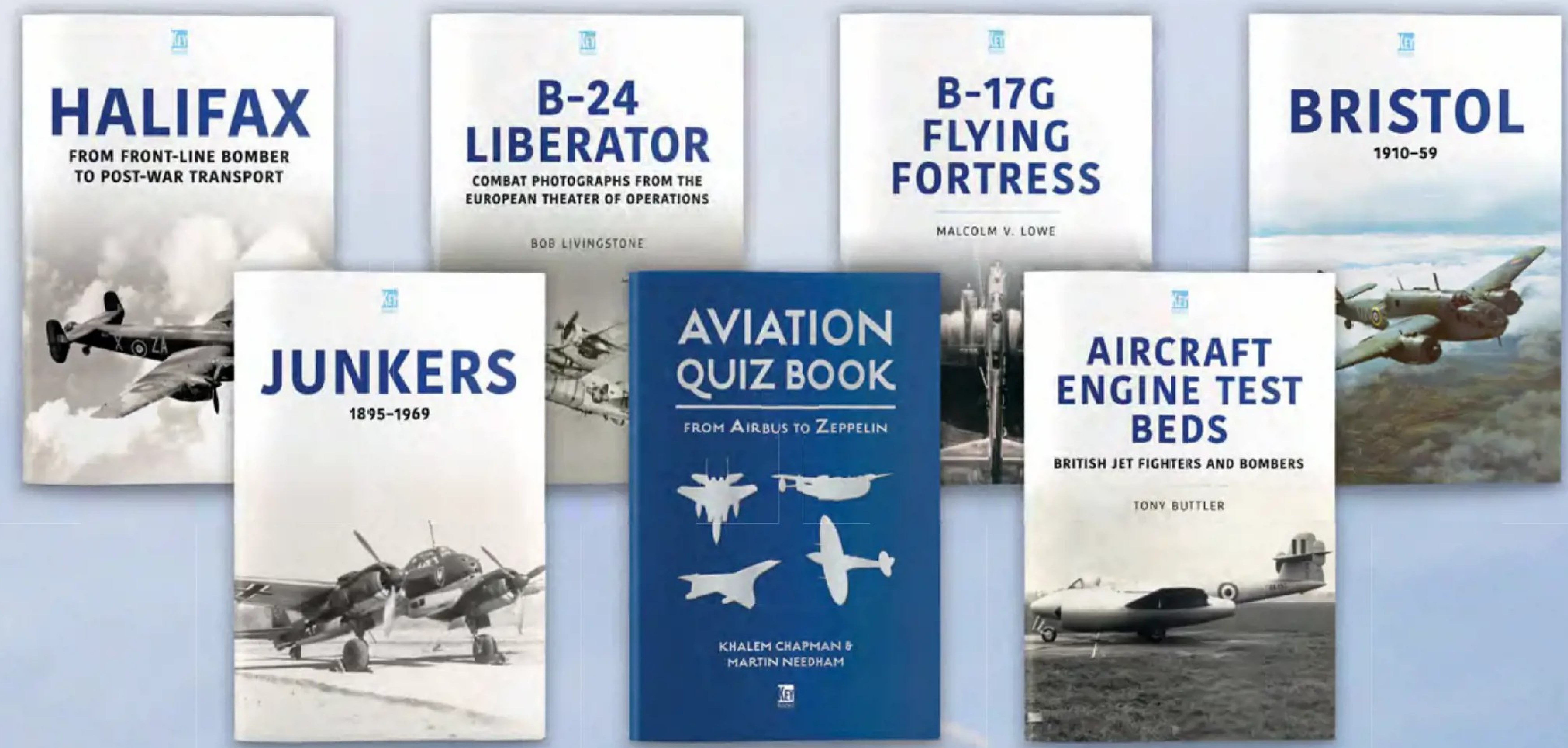
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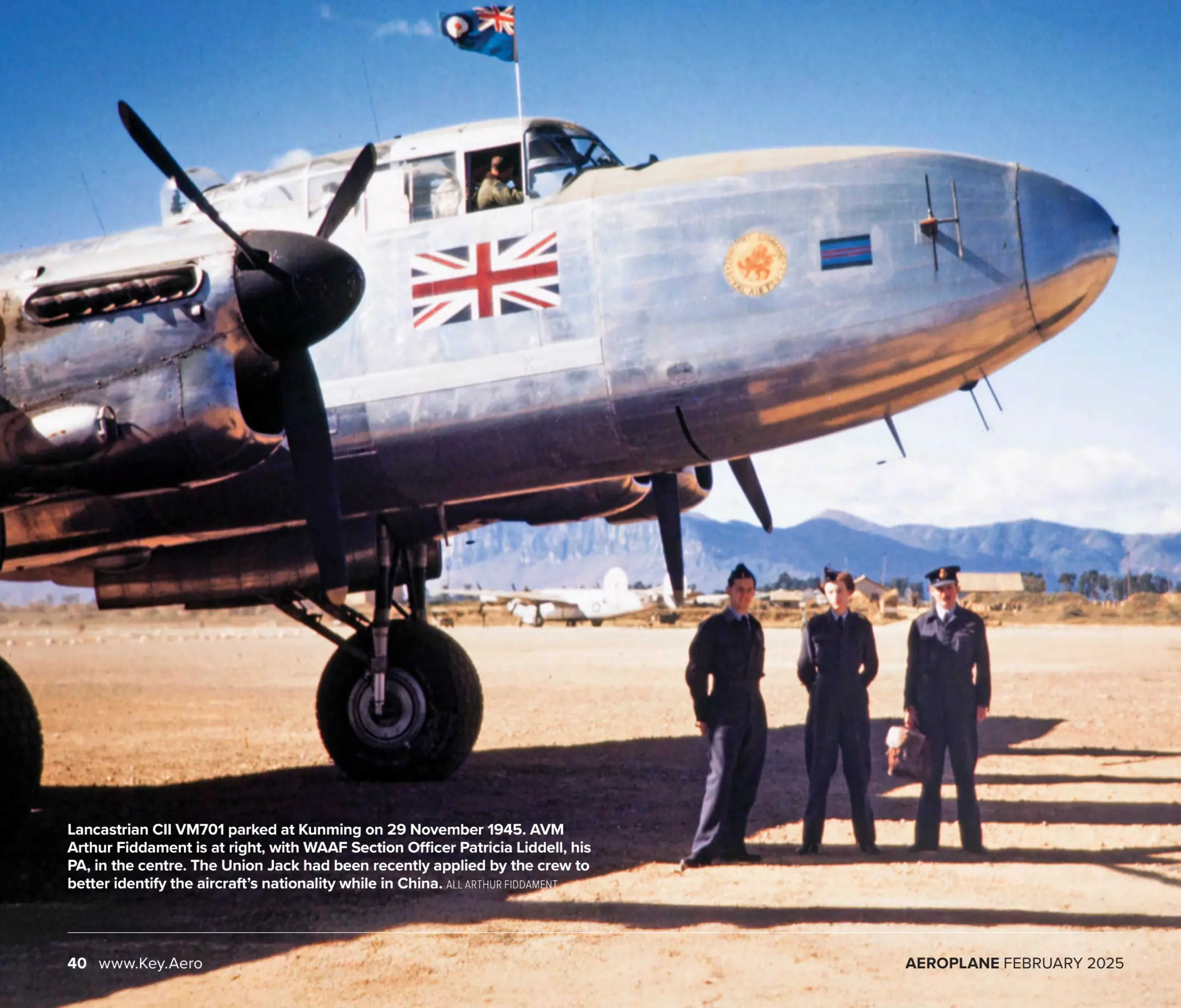
VOYAGE OF DISCOVERY

When a senior Transport Command officer carried out a peacetime world tour, preparing for a new era of air transport, it was to an Avro Lancastrian that he turned — and his own, superb, colour photos document the journey **WORDS:** BEN DUNNELL



Lancastrian CII VM701 parked at Kunming on 29 November 1945. AVM Arthur Fiddament is at right, with WAAF Section Officer Patricia Liddell, his PA, in the centre. The Union Jack had been recently applied by the crew to better identify the aircraft's nationality while in China. ALL ARTHUR FIDDAMENT

ABOVE: The Lancastrian's Rolls-Royce Merlin 24s on song as the aeroplane heads out of Delhi.

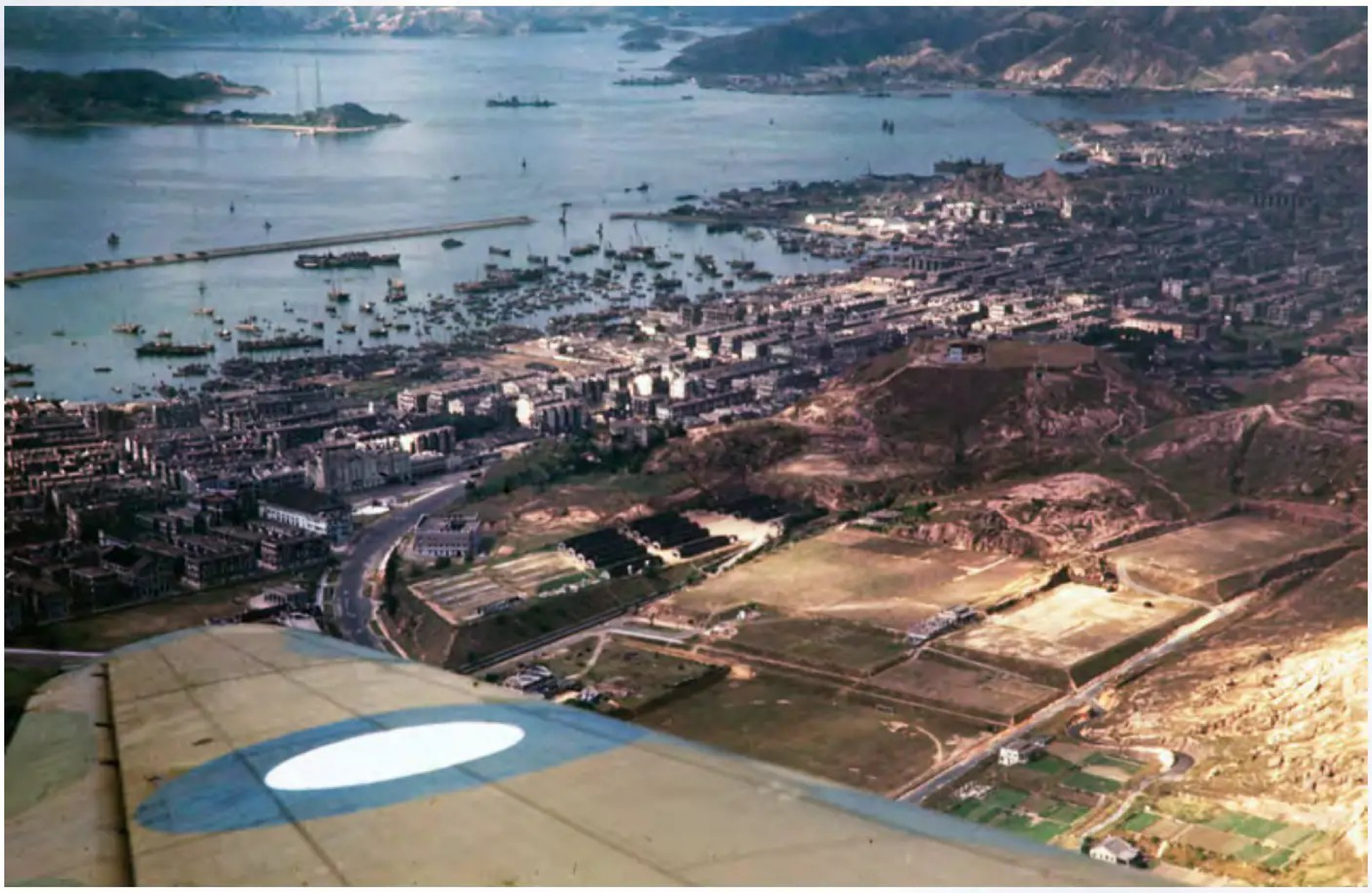
"Although the time available for him was brief, he was able, by his energy and determination, to thoroughly organize the group by D-Day. During and subsequent to the invasion of France he has shown outstanding powers of leadership and command, and the excellent work of the aircrews was undoubtedly due to his inspiration."

Given the importance of No 46 Group, RAF's troop carrier force during the invasion of Europe, the award of France's Légion d'Honneur to Air Vice-Marshal Arthur Fiddament, for which that citation was written, was richly deserved. It concluded by describing him as, "an outstanding and loyal officer". Already Fiddament had flown as an instructor and as an operational pilot during the First World War, while his activities on the front line in Waziristan, at the controls of Bristol F2B Fighters, saw him receiving a Distinguished Flying Cross in 1920. A host of postings later, he had a significant contribution to make to the post-war world.

This was in the role of Senior Air Staff Officer in Transport Command headquarters, as it prepared for a new era. With the end of global hostilities, there was a need to ascertain where problems might occur in peacetime military air transport — especially in trooping around the Empire — and how they might be solved. At the same time, doing so offered an opportunity to fly the British flag. And how better to do so than in a new British aeroplane?

It was never the most practical proposition for most regular roles, but as a stop-gap the Avro 691 Lancastrian became a pioneer. In its future were commercial firsts, most notably the inaugural operation from London's new airport at Heathrow and services on routes linking Britain to South America and Australia. Yet the Lancaster offshoot's debut in the wider headlines occurred thanks to the RAF. Following on from the Lancastrian CI, of which the majority of 22 built were handed over to the British Overseas Airways Corporation, 18 examples of the MkII went the air force's way,

LEFT: The Taj Mahal was overflown on the sector between Delhi and Colombo.



ABOVE: The Kowloon area of Hong Kong on 26 November 1945, as viewed from a Dakota.

BELOW: Abandoned Japanese aircraft at Singapore's Changi airfield. Nearest is a Mitsubishi Ki-46-II 'Dinah', followed by a Mansyu Ki-79, a Tachikawa Ki-54 'Hickory', a Tachikawa Ki-36 'Ida' and a Nakajima Ki-44 'Tojo'.

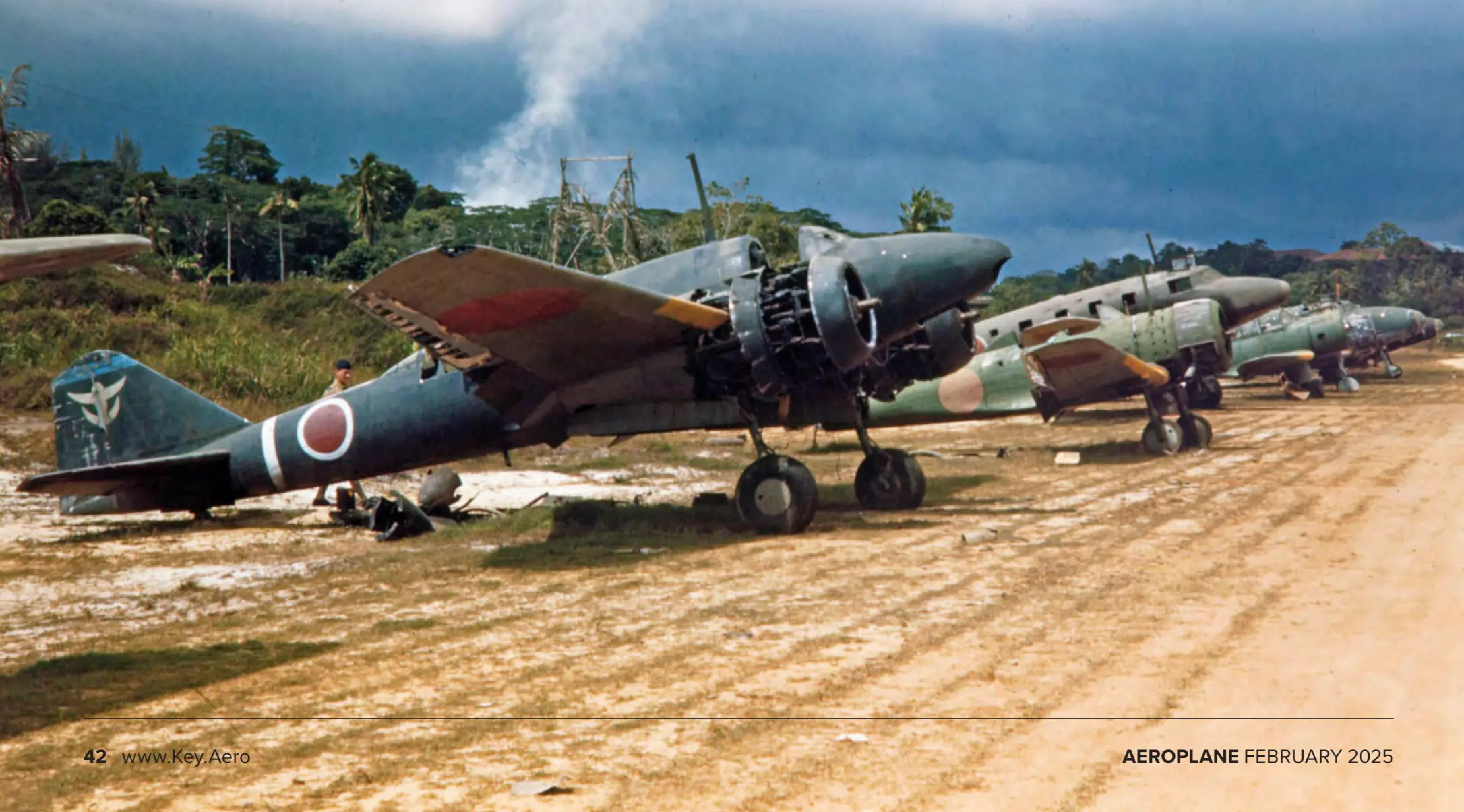
beginning with serial VM701. Delivered in October 1945, the next month it made history of its own as the mount for Fiddament's fact-finding mission.

This was to be no ceremonial senior officer's 'jolly'. Rather, it was to be carried out with a minimum crew and no special maintenance arrangements. The objective was to be as operationally representative as possible, and it was with this in mind that Fiddament drove from his home at Burnham-on-Sea, Somerset, to RAF Lyneham on the afternoon of 11 November 1945. At the Wiltshire base he was joined by his deputy, Air Cdre Francis Braithwaite, his personal staff officer Wg Cdr Ralph Mottram and his personal assistant, WAAF Section Officer Patricia Liddell. She would attract a great deal of attention along the way.

> *"This world flight was to be no ceremonial senior officer's 'jolly'"*

Well she might have, for Liddell was a notable figure in her own right. That January the 22-year-old had married Capt Ian Liddell, a member of the 5th Battalion, Coldstream Guards. Tasked on 3 April to capture a bridge across the River Ems close to Lingen, Germany, he crossed it under heavy fire, cutting the wires on a number of 500lb bombs which had been mounted on the structure to blow it up and deny its use by the Allies. This he did on both sides of the bridge, and below it as well. Only then did he signal to his men that they should advance, which they did. An important river crossing was duly opened. Liddell lost his life just 18 days later, killed by a German sniper near Rotenburg an der Wümme. For what was described as his "outstanding gallantry and superb example of courage", which "will never be forgotten by those who saw it", on 7 June he was posthumously awarded the Victoria Cross.

His widow, Braithwaite and Mottram were on a tight schedule. Having not reached Lyneham until one o'clock in the morning, just six-and-a-half hours later the whole crew set off from their nearby accommodation to the airfield. There the morning of 12 November brought what Fiddament described in his diary as, "bitter cold, misty, damp weather — first heavy frost of year". Boarding the Lancastrian, in the cockpit they found the aircrew members. The captain, Flt Lt Harold Payne, second pilot Fg Off M. W. Heath and navigator Flt Lt A. R.



Newitt were drawn from No 511 Squadron, which operated another Avro transport in the shape of the York. On board with them were a wireless operator, flight engineer, air quartermaster, fitter and rigger.

Lifting off at 08.45hrs, VM701 found itself in "brilliant sunshine" when it crossed the English coast. Traversing France and passing overhead Corsica and Sardinia, RAF Luqa in Malta was the first port of call. There in the warm Mediterranean sunshine Braithwaite was met by his brother, a wartime PoW, "whom he had not seen for many years". Almost straight away they attended a conference on area control, before the hospitality began. Fiddament noted how the Maltese, still suffering the lingering hardships of so much wartime bombing, often lived in "caves in the rock without proper light or ventilation."

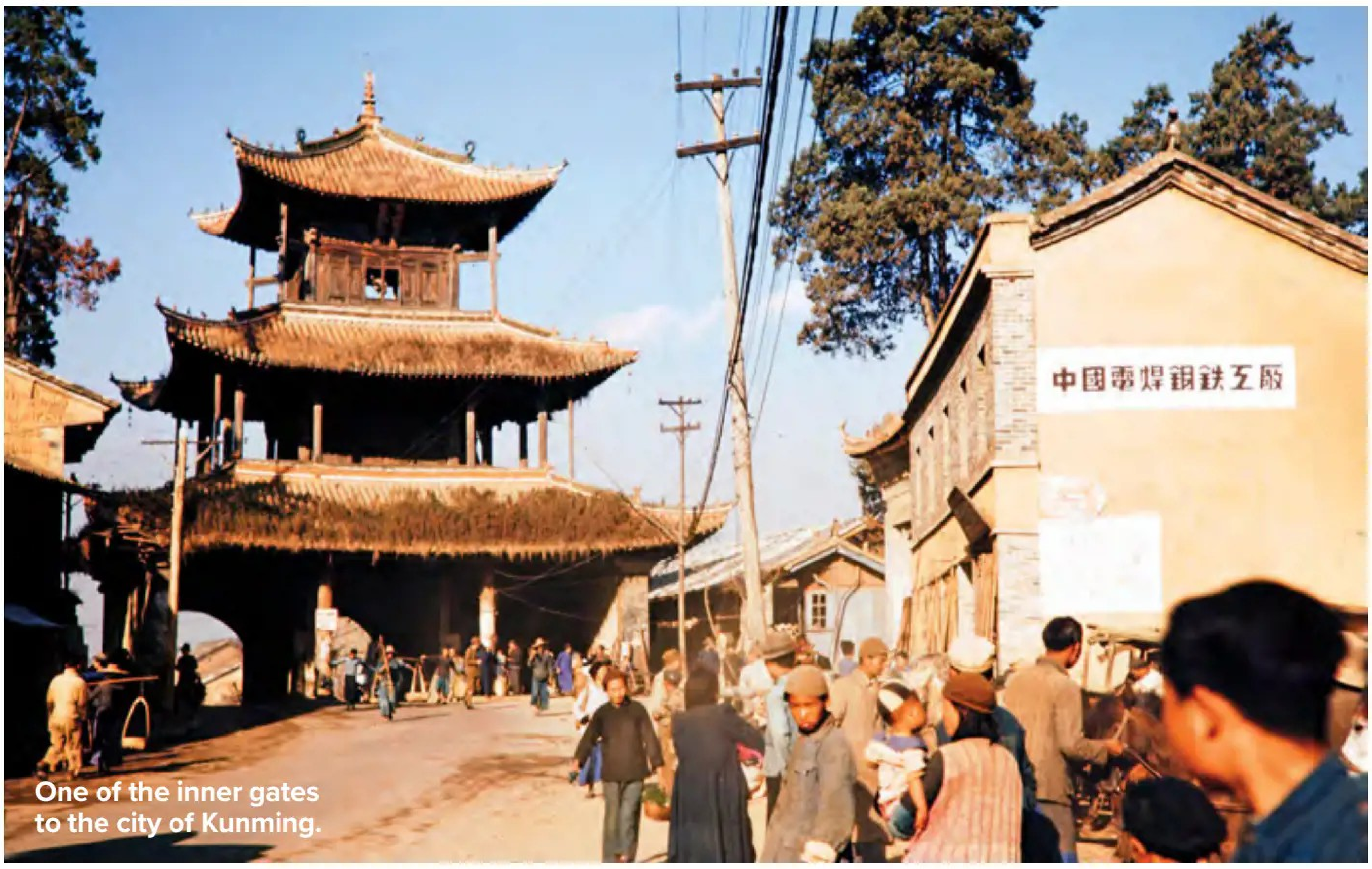
◆

Cairo followed the next day. Over the West African coast, those on board — also including Air Cdre Francis Fressanges, Air Officer Commanding No 47 Group — were served a "very unimaginative lunch consisting of tinned pilchards with which the passengers became increasingly familiar throughout the trip". After landing at Almaza there was an encounter with another Transport Command party, flying home after visiting stations in the Persian Gulf and southern Arabia, and to talk with the AOC No 216 Group.

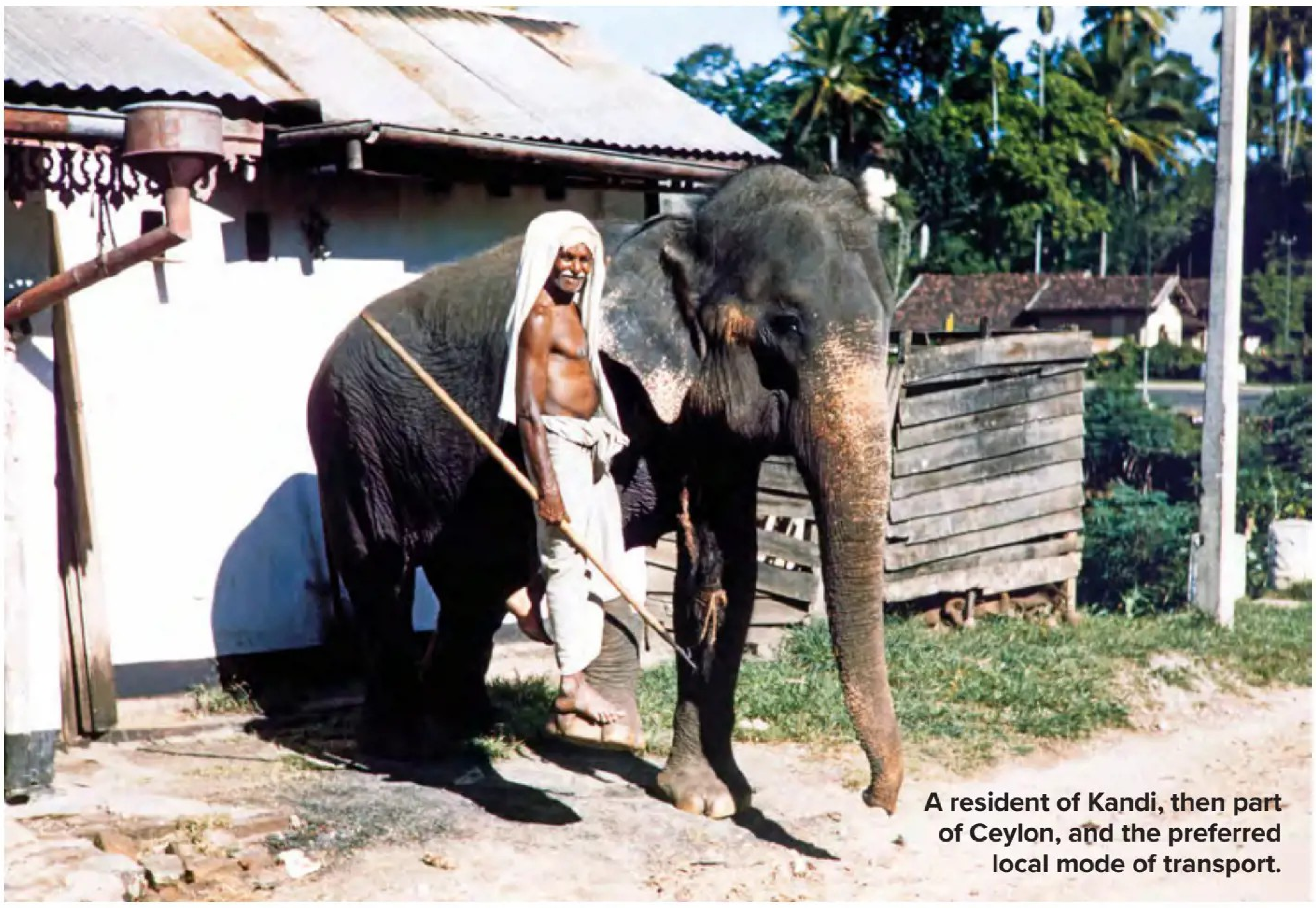
With another early start, Mauripur, Karachi was reached after dark on the 14th. There the Lancastrian and those on board were sprayed with DDT in advance of leaving the aeroplane. Fiddament found much to look at — a new area control operations room, for example — in inspecting the RAF's local facilities, before the 15th brought departure to Palam airfield in Delhi. The pattern was a well-known one: discussions with senior officers, and the inevitable array of functions.

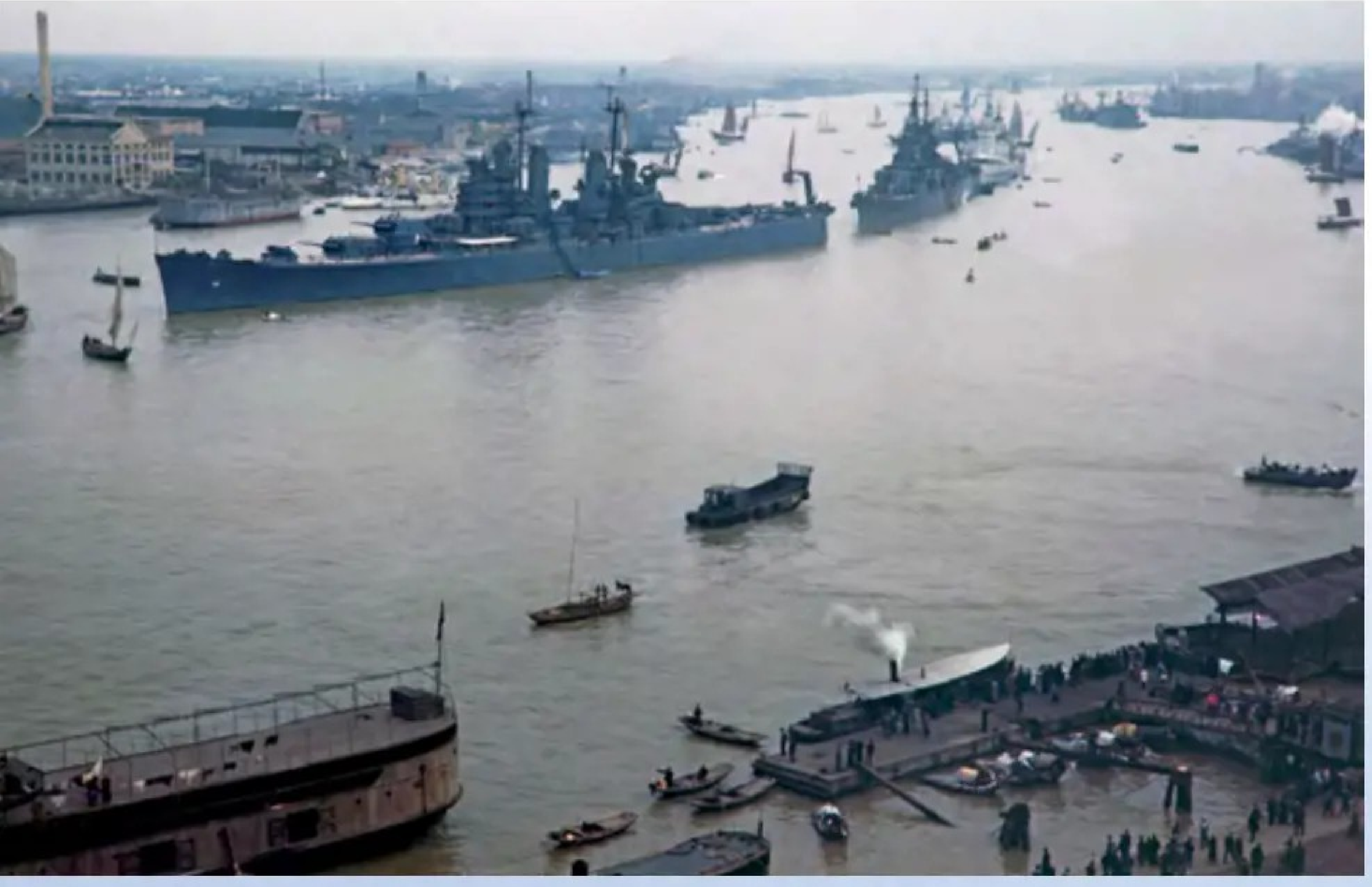
The Taj Mahal was a significant landmark as the Lancastrian cruised through the warm air to the Sri Lankan capital Colombo on 17 November. It touched down at Ratmalana airport, a road journey following through the jungle to Kandi, where the British officers' club was to be found. There, Fiddament wrote of how elephants were used for transport: "A Civil Service mentality has

Cruising along at altitude near Bangalore.



One of the inner gates to the city of Kunming.


A resident of Kandi, then part of Ceylon, and the preferred local mode of transport.



US Navy vessels dominate the Huangpu River in central Shanghai. This was known as 'Warship Row', and was photographed from the Cathay Hotel on the Bund.

Fiddament captured many charming, candid shots of locals in the cities he visited, including this one of a brightly clad child at a Kunming fruit stall.

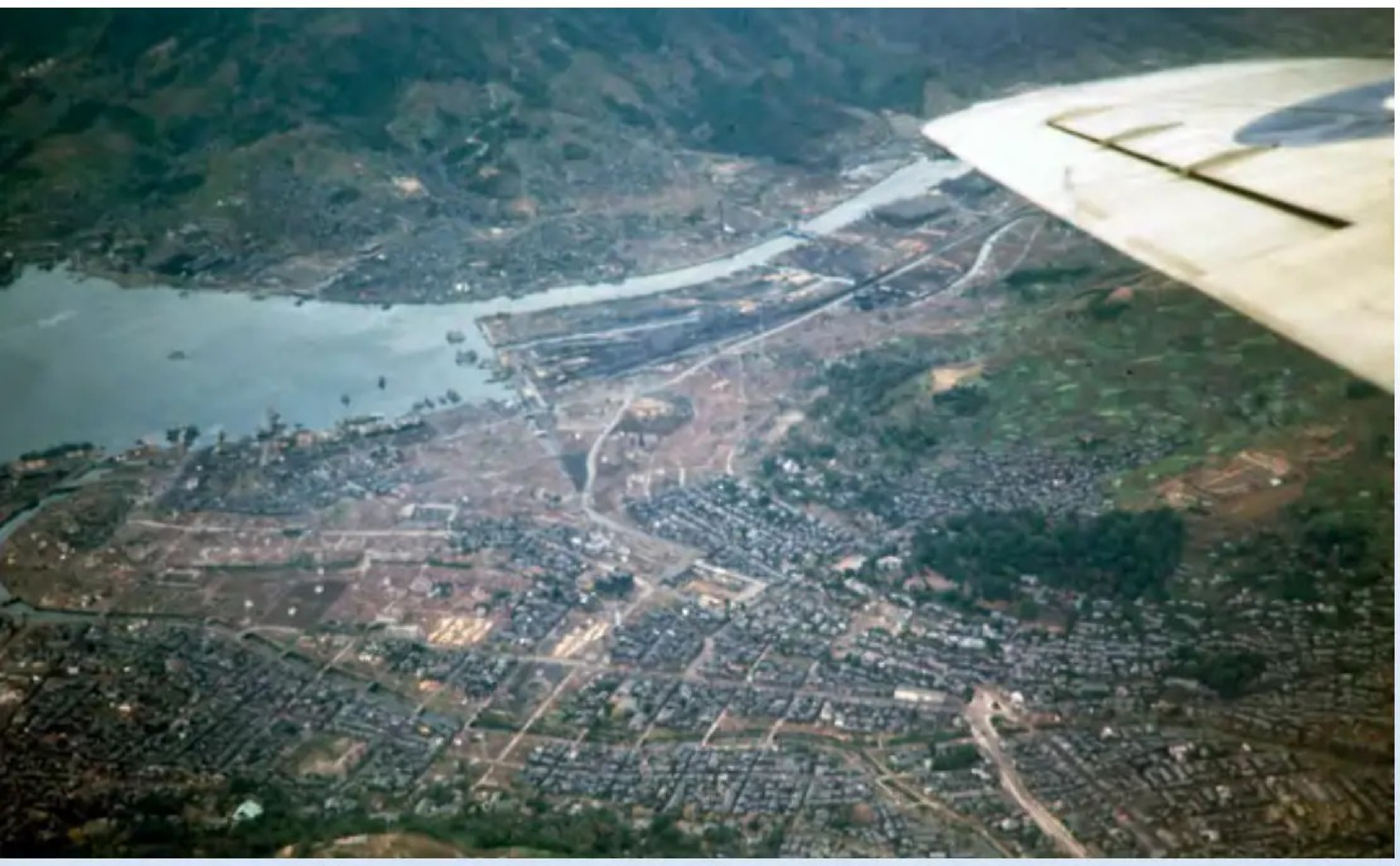
started among the elephants, who know when it is time to knock-off and resent being asked to work overtime". By contrast, indicating the importance of this theatre, there were some notable dignitaries to see. One was ACM Sir Keith Park, as of this point Air Commander, South-East Asia Command. Then there was Admiral Lord Mountbatten, from 1943-47 in post as Supreme Commander South-East Asia.

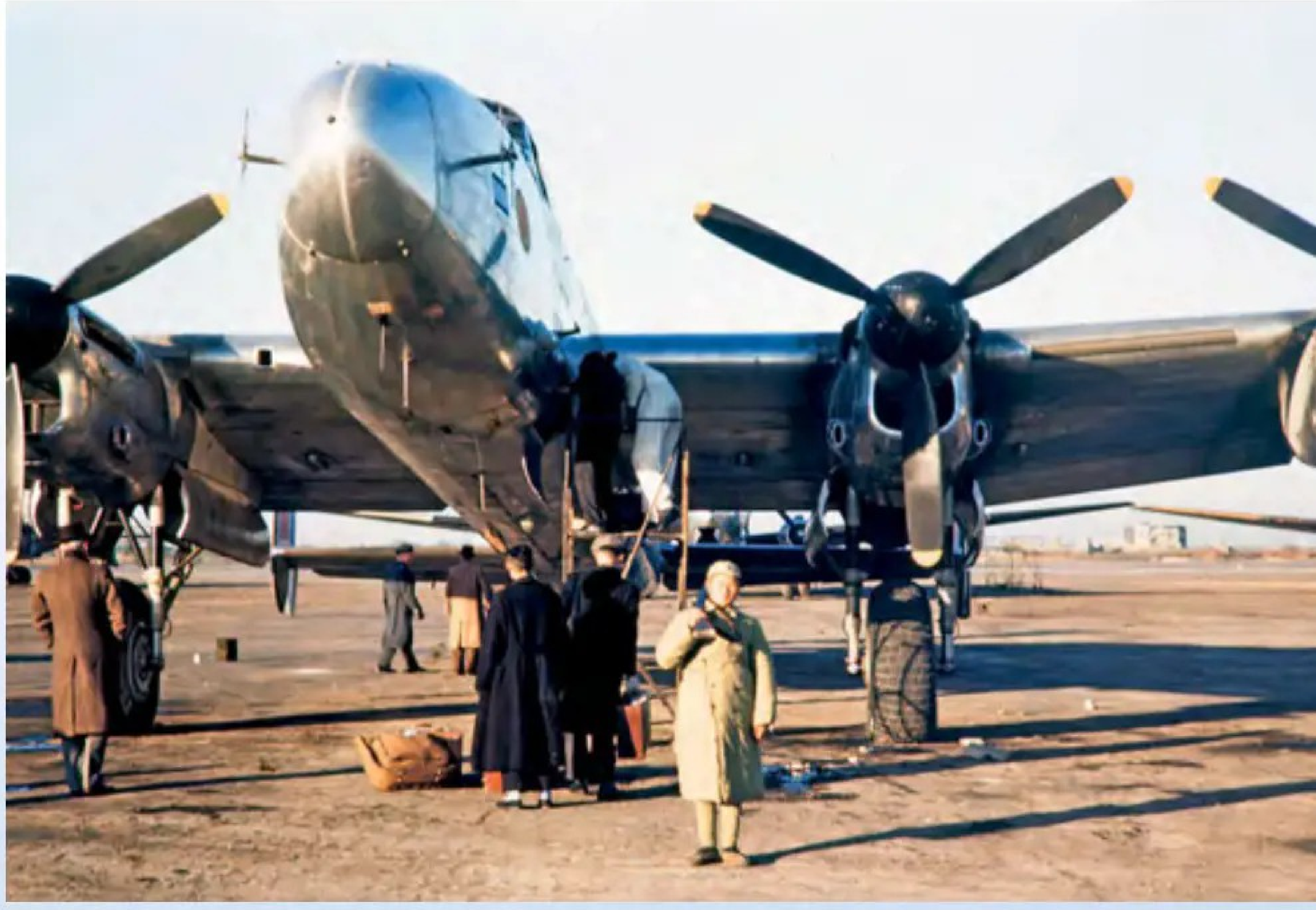
By the time the party headed onwards, on 21 November, the Lancastrian's crew had adorned the aeroplane with two large Union Jacks and an air vice-marshal's flag, lest there be any confusion as to its ownership. The low-level leg to Pegu, Rangoon necessitated flying through a monsoon, but VM701 emerged unscathed. Even so, it was a Dakota which provided the next form of transport out to Mingaladon. Rangoon itself Fiddament called "drab and war weary"; visiting the Golden Pagoda, he couldn't help but notice how, around it, "native families live in filth and squalor..."

The Dakota was at their disposal for visits to Singapore, Saigon in what was then French Indochina, and Hong Kong. Each was an experience. The shops of Singapore they found "full of luxury articles at fabulous prices", thanks to "the cleverness of the Chinese in hiding such articles during the occupation [...] by the Japanese". More poignant was the British PoW graveyard next to Changi airfield, which had been built by the prisoners. Trouble between the French — with British support — and the Vietnamese had subsided; in Saigon, Fiddament felt more perturbed by his Gurkha guard, who "even watched over him whilst he was having a bath and called him the next morning holding a live rifle with fixed bayonet in one hand and a cup of tea in the other". Of special interest in Hong Kong was a visit to the proposed site of a new military and civil airfield at Ping Shan, construction of which was halted the following April after BOAC declared it too far from the city and the government refused to fund it for the RAF alone.

Although the situation at some locations was better than others, everywhere Fiddament went he found personnel coping with significant challenges. The ravages of war were often still very apparent, for instance in uncertain supplies of such essentials as basic foodstuffs and water. Even the most rudimentary equipment could be lacking. Yet Transport Command personnel toiled on. At Kunming in southern China, where it was a relief to find the Lancastrian waiting for them on 28 November, a "very happy" RAF staging post had, Fiddament commented, done "Stupendous work [...] in carrying supplies and petrol by air."

Delayed by some bad weather, on 30 November VM701 departed for Chongqing, then referred to as Chungking, the wartime capital of the Republic of China. The Lancastrian "aroused tremendous interest", not least "great admiration" among the Americans "for its appearance and performance". Given the superiority of their own Douglas transports in numerous respects, perhaps they were being polite. On this leg the — American-supplied — radio compass failed, an aircraft from the China National Aviation Corporation being called on as an escort. It was repaired for 1 December's flight to Shanghai.





The opportunity to explore Chinese cities was fascinating. Fiddament had taken up colour photography while posted to Washington DC as part of a wartime RAF delegation in 1941-42, and the Kodachrome slides he captured on this part of the Lancastrian tour are notably fine examples. In turn, the locals showed great interest in the Westerner with his camera.

Once this and the serious business was complete, leaving proved harder than anticipated. At 08.00 on 4 December, the crew was ready to go, but the Lancastrian had been impounded by the authorities. It sat on the apron at Jiangwan airfield with a guard of, said Fiddament, "Chinese soldiers with loaded rifles who had orders to shoot if we attempted to start up". Lt Col Li Kuo-pei, the Chinese air force liaison officer to Transport Command who had been with the group since it arrived in Rangoon, smoothed things over and VM810 was away an hour later. The Chinese captain responsible lost his job.

Proceeding to Atsugi in Japan, the aircraft overflew Nagasaki. Only months after it was hit by the second atomic bomb, Fiddament's comment was, "nothing remains over [an] extensive area". Tokyo, too, bore savage scars. Meetings were had with senior American and Australian officers, but this was a short stop en route to Tacloban on Leyte Island in the Philippines. The overnight flight landed at 06.10, just before the weather closed in. Luckily nothing happened on touchdown, for local personnel had a novel way of dealing with damaged aeroplanes. "One of our own 300 Group Dakotas", Fiddament recalled, "which got a flat tyre after landing and which waited for maintenance personnel to come out to it, was met instead by a 'bulldozer', the intention being to push the Dakota into the sea…"

> ***"They celebrated crossing the equator in nautical style, with a shave"***

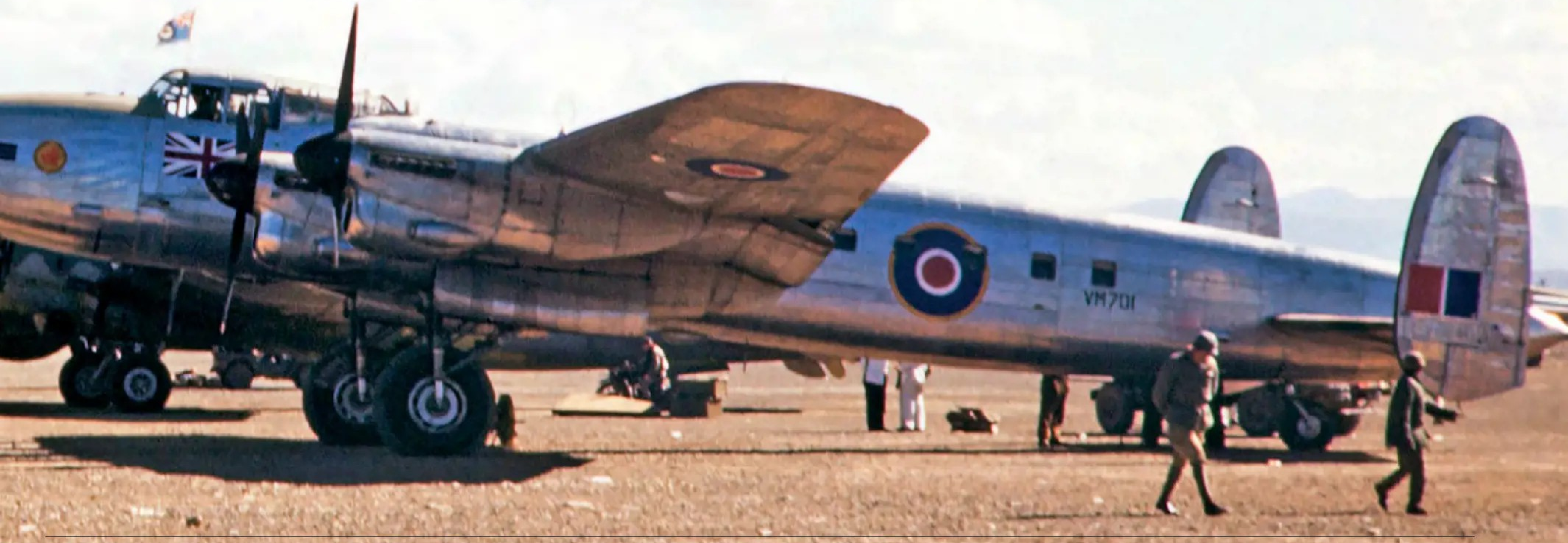
The Americans held sway here, too, though Tacloban hosted No 195 Staging Post, RAF. It worked in what Fiddament called "appalling conditions", so no wonder his party "was glad to leave". The crew and passengers celebrated crossing the equator in nautical style, giving each other a shave with a wooden razor made by the rigger. Only nine hours were spent in Darwin, and then it was on through the night — and a succession of electrical storms — to the Royal Australian Air Force base at Amberley, Queensland. The purpose was to visit No 194 Staging Post at Archerfield, nearer Brisbane, but incorrect information had stated it was too small to take a four-engined aircraft. A short ferry flight rectified the mistake.

Breakfast on 9 December was a very early affair, allowing an 05.45

ABOVE LEFT: Dipping a wing over devastated Nagasaki.

ABOVE: You're not going anywhere! An over-officious Chinese guard prevents the Lancastrian from leaving Shanghai's Jiangwan airfield.

BELOW: At Kunming on 29 November 1945, the Lancastrian shares the gravel apron with a C-46 Commando, a freight pannier-equipped Halifax and a number of Republic of China Air Force C-47 Skytrains.



ABOVE: A very stormy night in Darwin — and the onward flight wasn't any calmer.

departure from Archerfield to Nadi, Fiji. The reception there was like nowhere else, a native ceremony at one of the king's bungalows seeing the presentation to Fiddament of the Order of the Whale's Tooth. "This is the greatest honour the Fijians can confer on a white man", its recipient noted, "and only three others have received this honour since 1939."

The vagaries of time zones saw to it that the Lancastrian left Nadi at 11.35 local on the 10th and landed at Canton, about the mid-point in the Pacific between Fiji and Hawaii, at 18.40 local on the 9th. Safely down on the "tiny island of coral with no vegetation", Fiddament joked that he "would claim an extra day's pay from the Air Ministry". Hickam Field was their arrival point in Hawaii, and the only place where technical issues intervened. Airborne at 21.00 on the 11th, the constant-speed unit on the number three Merlin engine was found to be defective and the artificial horizon unserviceable. VM701 circled over Honolulu for three hours to get down to landing weight. On the ground, the trouble was traced to a detached control rod, and the crew, "revived by bacon and eggs", were back in the air at three the next morning.

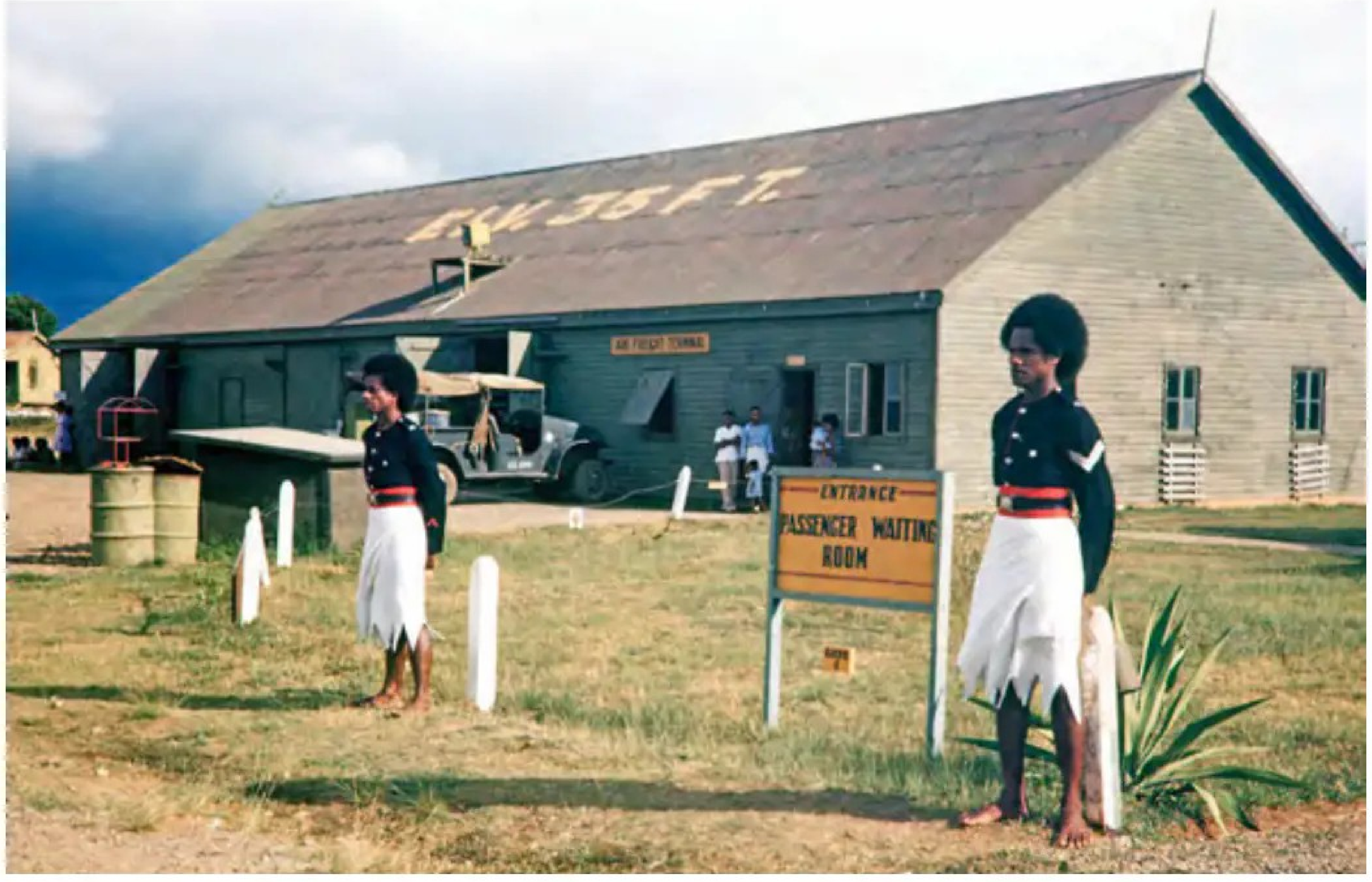
Traversing the US didn't go ahead as planned; San Francisco's Hamilton Field was open, but the weather in Washington was so bad the Lancastrian routed through Chicago, in "freezing cold and driving snow", on its way to Montreal. At Dorval, mid-afternoon on the 14th, there was "snow on the ground" and the temperature was -8°C. Fiddament had more official business to conduct, but there was the opportunity for some rest, recreation and Christmas present-buying until the 18th, when Gander, Newfoundland was the destination. "The heating in the aircraft had failed en route from Montreal and the party were exceedingly grateful to reach a warm house" — that of No 83 Staging Post's CO, Wg Cdr Botting, where they "thawed in front of the fire."

> ***"The heating in the aircraft had failed en route from Montreal"***

Not for long, though, because the final leg began at 20.05 that evening. Above the clouds, they witnessed the eclipse of the moon as the Lancastrian cruised through the darkness. It was thought to divert the aeroplane into Northolt, and the press were sent there. But at 10.45 on 18 December, VM701 touched down as planned at Blackbushe, the conditions wet and windy. "The party's enthusiasm on reaching home", said Fiddament, "was slightly dampened". But they'd made it, and, what's more, without any major problems. The few spares carried did not have to be used. Including the sectors on the Dakota, the group had travelled 33,963 miles over 36 days.

What of the results? According to *The Aeroplane*, speaking to Fiddament afterwards, "Chief difficulties encountered were in getting reliable information about the weather ahead, advance meteorological forecasts, and precise data regarding the state of airfields on which the Lancastrian would have to land, and, in particular, information about runways, radio aids, etc. That kind of thing, he says, will have to be tied up on an international basis. Local facilities are changing all the time.

"He considers pressure cabins very desirable for all but feeder-line passenger aircraft, apart from being a necessity in all high-flying passenger work. Lack of a pressure cabin, he points out, means loss of sleep and rest, if the aeroplane is obliged to climb to 15,000 ft or so when flying over a 'front'. Passengers have to be awakened at night, told to put on their oxygen masks, and, later, told to take them off again, when descending.



RIGHT: The passenger and freight terminal at Nadi airport in Fiji, complete with a ceremonial guard provided by the Fijian army.

OPPOSITE PAGE: US Army vehicles with the Lancastrian during its stop in Fiji. The aeroplane had Transport Command's emblem applied on the nose between the Union Jack and the stripes to denote its use by an air vice-marshal.

"The Air Vice-Marshal regards engine noise as conducive to sleep (it often is, when not too loud) and he found that the increased speed of the Lancastrian — 240mph as against 150 to 190 in earlier types — reduces fatigue; longer distances can be covered, with shorter periods in the air. His conclusion is that the Tudors and Vikings, when they come into service next year, should be very comfortable.

"The Lancastrian arrived back in England only 24 hours behind schedule, despite the fact that it was held up one-and-a-half days in China by bad weather, and, later, had to fly South via Port Darwin and Brisbane and Darwin, avoiding New Guinea. In the course of his trip, Air Vice-Marshal Fiddament completed, in five weeks, work which a few years ago could not have been done in less than six months."

But it was Patricia Liddell who occupied most column inches in the popular press. The *Daily Herald* was typical. "[She] found that while flying she could get through her office work in a quarter of the usual time — no one could interrupt her by telephone calls. So she had time to keep a sharp look-out for the one thing she wanted most — silk stockings… 'There just aren't any in the world,' said [Patricia], who ought to know at the end of a 36,000-mile [sic] search for them."

Calling her a "World-flying Girl Stenographer", the *Montreal Star* quoted Liddell as saying, "It was fun, it was hard work and there's nothing else to report". She did, however, add that she'd been reacquainted with old friends in Shanghai, Ceylon and Australia, and that she was "rather cross with the United States customs people for unpicking the flowers" she'd been given in Hawaii.

The *Montreal Gazette*, meanwhile, took a different tack. Under the headline "Whiskerless St Nick Flying To Britain With Yule Gifts", it likened pilot Payne to an "airborne Santa Claus", so many gifts and provisions had been purchased in the city. But more seriously, the paper — whose foreign affairs editor Cyril Bassett had previously edited the Transport Command Navigation Bulletin — highlighted Fiddament's key points. "In India they made arrangements for the ferrying in and out of British forces and for the despatch of supplies. In Japan, after consultations with high officials, they went into discussions on the ferrying of troops and supplies for the occupation armies". And with newer, faster aircraft coming along, the prospects for Transport Command and long-range air links more generally would only be further improved.

As a generator of good global publicity for the peacetime RAF, the Lancastrian's world flight could scarcely have been bettered. Its value in more tangible, operational terms was considerable. And just a couple of months after they returned, on 12 February Patricia Liddell went to Buckingham Palace to receive her husband's VC. Another story had come full-circle.

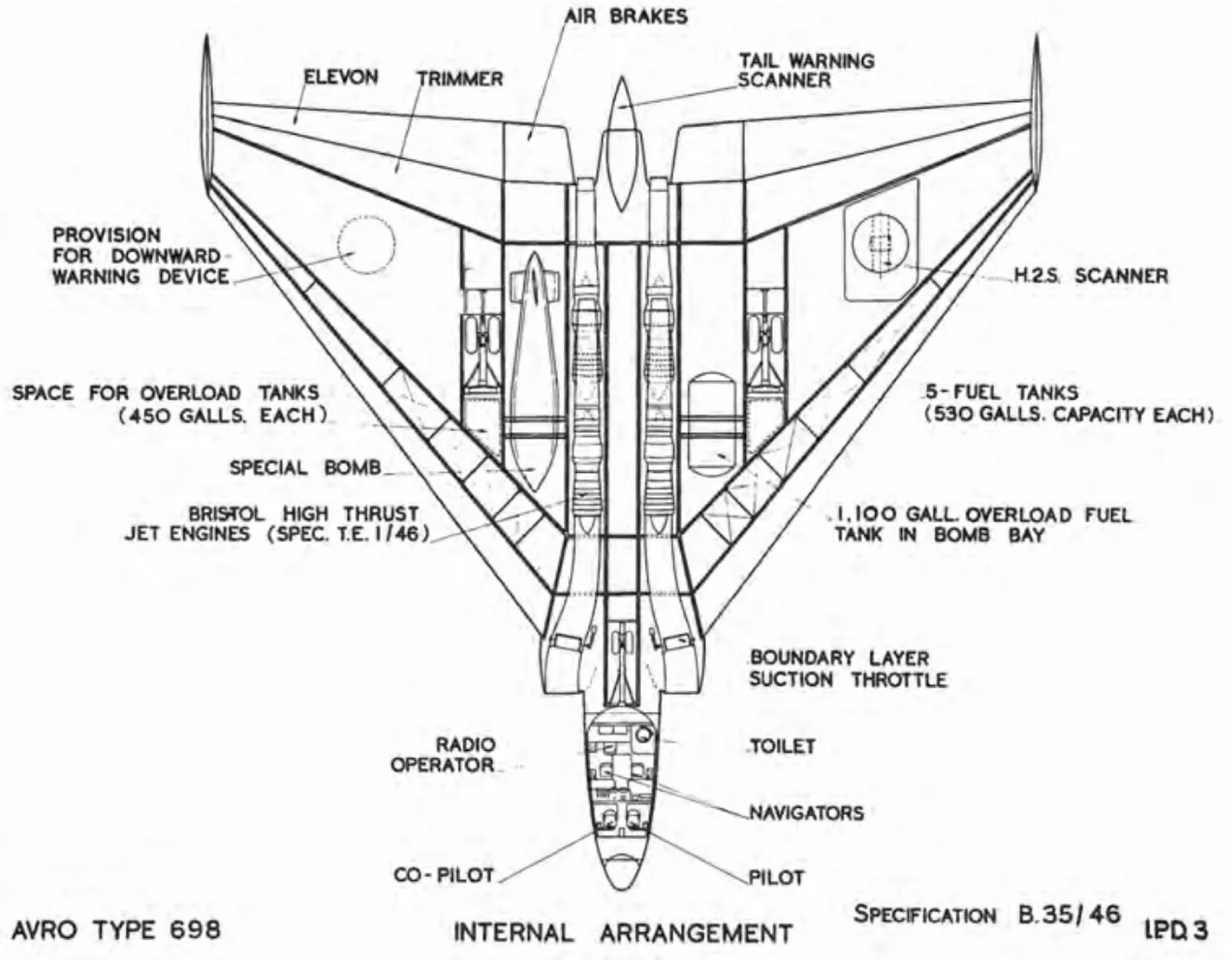
ABOVE LEFT: Patricia Liddell with a Fijian infant. A large number of children attended the gathering staged in honour of the British visitors.

ABOVE: Fiddament, centre, sporting the Fijian Order of the Whale's Tooth. His deputy, Air Cdre Francis Braithwaite, wears the turquoise garland.

With thanks to Jamie Carstairs at the University of Bristol, to Arthur Fiddament's daughter Rosemary Booker, and to Joe Picarella. All images courtesy of Special Collections, University of Bristol Library — visit www.hpcbristol.net

THE SHAPE OF SUCCESS

In conceiving a design for a new RAF 'medium bomber' as the 1940s drew to a close, Avro was pushing up against the limits of aviation technology. How, exactly, did its Avro 698 — better-known as the Vulcan — break the mould so successfully? **WORDS:** STEPHEN LIDDLE


AIR BRAKES
ELEVON
TRIMMER
TAIL WARNING SCANNER
PROVISION FOR DOWNWARD WARNING DEVICE
H.2.S. SCANNER
SPACE FOR OVERLOAD TANKS (450 GALLS. EACH)
5 - FUEL TANKS (530 GALLS. CAPACITY EACH)
SPECIAL BOMB
BRISTOL HIGH THRUST JET ENGINES (SPEC. T.E. 1/46)
1,100 GALL. OVERLOAD FUEL TANK IN BOMB BAY
BOUNDARY LAYER SUCTION THROTTLE
RADIO OPERATOR
TOILET
NAVIGATORS
CO-PILOT
PILOT
AVRO TYPE 698
INTERNAL ARRANGEMENT
SPECIFICATION B.35/46
LPD 3

ABOVE: Avro's 698 medium bomber design to specification B35/46 as at May 1947 — a delta, but a 'flying wing', with small fins located on the tips. BAE SYSTEMS

In July 1945, Britain's new Prime Minister Clement Attlee had been elected on a platform of bringing the lessons of the past years to a hard-won peace. UK expenditure on defence was the equivalent of a staggering 52 per cent of GDP that year, paying for mass mobilisation to fight an industrialised, attritional, global war. The wealth of the country would be democratised, it was hoped, through the NHS and extensive planned house-building. Before any of this happened, Attlee made clear that security — as a means of avoiding the horrors of the recent conflict and to provide an environment suitable to attract investment — was a pre-requisite.

The day after the Nagasaki attack, he wrote a briefing note to a newly formed Cabinet committee, GEN 75, which would be tasked with understanding the appropriate UK response to the new order. Said Attlee, "the modern conception of war to which in my lifetime we have become accustomed is now completely out of date. We recognised or some of us did before this war that bombing could only be answered by counter bombing. We were right. Berlin and Magdeburg were the only answer to London and Coventry. Both derive from Guernica. The answer to an atomic bomb on London is an atomic bomb on another great city."

It would be January 1947 before the action to produce the atomic bomb was agreed. This was a world without NATO, an effective United Nations organisation and with an isolationist nuclear policy in the United States, which banned the transfer of the relevant secrets to Canada and the UK, despite their respective roles in the Manhattan Project. If there were to be a nuclear deterrent to ensure the peace, then Britain could either shelter under an uncertain American umbrella, or else go it alone.

There was only one viable way to deliver an atomic bomb in 1947: a manned bomber aircraft. The B-29 had used its extraordinary performance — capable of outpacing the fighters sent to intercept it at its 30,000ft operating altitude — to keep safe, then an array of linked optical and electronic aids to place the bomb with sufficient accuracy. How high-flying and how fast would the new B35/46 bomber need to be? This question was tackled scientifically by Don Hallows at the Royal Aircraft Establishment in 1945. Envisaging a Rolls-Royce Nene-powered fighter with a top speed of 600mph, his conclusion was that a bomber flying at 500mph and 50,000ft (Mach 0.76) would evade interception on 70-90 per cent of occasions. This and other work would demonstrate that, to perform a level turn of a reasonable radius and get behind the target, the fighter's speed and ceiling had to be substantially superior. By the time B35/46 was issued, an element of future-proofing had crept in, with the cruise speed now required to be 500kt (Mach 0.875). This couldn't just be a stronger, more powerful Lancaster, but instead an aircraft designed to operate with regions of supersonic flow over its surfaces, the so-called transonic regime.

> *"The advantages of wing sweepback did not come for free"*

The configuration

As large, load-carrying aircraft, the B35/46 contenders would need the new technology of wing sweep, allowing a reasonable thickness for structure and fuel tank volume, while managing the high Mach number effects. Sweepback postponed the drag rise associated with shockwave formation, giving the efficiency needed. The advantages were not for free, as positioning the tips rearwards of the root meant the lift generated outboard tried to twist the structure, so it had to be made stronger to resist. The German experience was that perhaps half of the theoretical drag divergence gain might be expected, while the natural loading of the tips caused stability and control problems.

The Avro team was certainly influenced by the profusion of high-speed designs they suddenly had access to in Germany, but this should not be overstated. Alexander Lippisch, the mind behind the Me 163 B Komet, had conceptualised low-aspect ratio, triangular configurations, which he believed ideal for supersonic fighters, while large, tail-less jet bombers were being conceived by Messerschmitt and others. Stuart Davies, the future Avro chief designer, made it clear that the drive to the delta planform was structural; the region behind a swept wing was 'filled in' and aspect ratio reduced to retain the same wing loading as a comparative tail-less design. J. R. Ewans, Avro's chief aerodynamicist, gave a detailed description in a contemporary article — pre-dating the first flight ➔

OPPOSITE PAGE: The first Vulcan prototype, VX770, flying out of Farnborough during the 1953 SBAC display in the hands of chief test pilot Roly Falk. The Avro 698 had been given the name Vulcan during the previous year's show. *AEROPLANE*

ABOVE: VX770 flew initially with Rolls-Royce Avon RA3 engines in place of the definitive Bristol Olympus powerplants, which were not yet available. In 1953 the Avons were removed and Armstrong Siddeley Sapphires installed; later, Rolls-Royce Conways took their place for a test programme with that engine, which ended with the aircraft's tragic in-flight break-up over Syerston in September 1958. *AEROPLANE*

of the 698 prototype — highlighting four design aspects as aerodynamic drivers towards the delta: sweep, thinness, low aspect ratio and low wing loading. The latter was absolutely critical to meet the high-altitude requirement.

Ewans and Davies recognised that by keeping lift coefficient, parasitic drag and structural weight low, then the penalty of low aspect ratio — or more correctly, span loading — on induced drag could be paid for. Unlike the tail-less swept designs considered by Handley Page, the tail-less delta had a wing that swallowed the fuselage, sharing their surface area and associated skin-friction drag. For Avro, this was attractive as it offered a way of using a conventional structural design and construction method, which was likely to prove inadequate in providing the stiffness needed by high-aspect ratio configurations at acceptable weight. Handley Page used a spot-welded honeycomb structure for the Victor wing, a pioneering application which required considerable time, effort and at least one restart to make ready, while the delta's inherent stiffness was something of a short-cut that allowed the learning established across 8,000 Manchesters, Lancasters and Lincolns to be deployed. It is clear Avro viewed the proposed delta aerodynamically as a low-aspect ratio, high-taper ratio swept wing; there was, as yet, no philosophy of exploiting controlled leading-edge separation and the slender wing aerodynamics that were still a little way in the future.

◆

A key difference between the Avro and Handley Page philosophies was choice of cruise lift coefficient, or to put it another way, how hard to work the wing. There was no such thing then as a transonic aerofoil, designed to exploit the new flow regime by working with the supersonic expansion. Instead, Avro concluded a lift coefficient of about 0.2 was a sensible limit, beyond which the effects of wave drag and unpredictable behaviour would be excessive. Handley Page worked with a more demanding value of 0.3, which if achievable implied the wing area would reduce in proportion, to just two-thirds of that required by the Vulcan, for the same lift force at the same speed. The approximate size of the bomb being known — along with, obviously, that of the crew, and to an extent the engines and systems — their work showed that the numbers started to come together. A 10 per cent thick root that needed to enclose a 6ft-diameter bomb implied a root chord of 60ft. This was the opposite of accepted practice; Avro had improved the efficiency of the Manchester-to-Lincoln sequence by progressively increasing aspect ratio from about six up to 10, while the B-29's was 11.5. The delta would be about three.

From an aerodynamic perspective, the properties of lower aspect ratio for a given wing loading did offer some positives. A span-wise load distribution optimised for minimum induced drag would be close to elliptical. Sweepback had the effect of overloading the tip region, so the optimum swept wing would be one with a greater taper than a straight wing, to compensate and move back to the elliptical ideal. Combining sweep, area and now very high taper naturally drew a triangle, while the long, deep root and large internal volume reduced the need for external discontinuities in the wing and its loading. The concentration of downwash over a shorter span tended to reduce the rate at which lift increased with incidence, known as the lift curve slope. In turn, this suppressed both peak velocity — important to delay shock formation and wave drag, and gust response. The concept of Avro's new 698 design hung together, using a radical shape to reduce risk in other aspects.

The great redesign of 1949

What was thought to be a viable design of the Avro 698 was available by what Stuart Davies referred to as the "appointed date" for design freeze, in September 1949. It had moved on considerably in the preceding year, recognisable today as an early form of the Vulcan, as opposed to the 'flying wing' ideas of Chadwick's early sketches.

Perhaps the most obvious differences are associated with the engines and wingtips. The wing root slot inlets were a feature of a forward, lower-sweep projection from the leading edge, while the jet pipes were roughly centrally mounted, projecting above and below. The tips were pointed, forming a 50°-swept triangle. The September 1948 design had incorporated a single, central tail fin, moving away from the fins close to the tips that had seemed attractive previously. This fitted the Avro philosophy of not making life harder than it needed to be; the potential effects of the outboard fins on tip stall were avoided, while a tailplane could be mounted if — in extremis — this was the only viable longitudinal stability and control strategy left. Nonetheless, a curve-ball was about to be thrown by emerging work at the Royal Aircraft Establishment, which would make both company and customer commit to a major redesign, even at this late stage.

High-speed wind tunnel tests of a half-model of the 698 — a new technique that allowed a greater Reynolds number to be simulated than a full model — were conducted in 1949 at the RAE. At the time, a series of full model tests on swept and delta configurations in the same tunnel began to trigger alarm bells. There were hints that the all-important drag divergence Mach number might in fact be lower for a delta than an equivalent swept wing, and that when applying these results to the 698 configuration, drag rise might occur considerably below the specified Mach 0.875 cruise. This was clearly a major risk to the success of the programme, especially so given the alternative swept design available from Handley Page. A conclusion from these tests was that modifications to the wing root were likely to give the best improvement, but these were some of the most disruptive imaginable.

> ***"Avro's 698 design used a radical shape to reduce risk"***

The outcome was a movement forward of the peak thickness at the root, increased to 12.3 per cent, together with the slotted intakes in the leading edge. These both promoted the sweep of isobars as far inboard as possible, vital for delaying shock formation. Near the tip, the outboard wing was thinned gradually to 8 per cent and cropped. The RAE was able to confirm that the wind tunnel liked what it saw. It would be April 1951 before a final configuration of the Victor passed the same milestone.

Unrecognised success: the Avro 707 testbeds

The lack of experience with delta-winged aircraft had been highlighted by the RAE's Advanced Bomber Project Group report as a major uncertainty in bringing about B35/46. Although a wind tunnel should provide accurate information about the forces and moments generated by these novel configurations, if this could only be done at low Reynolds numbers the conclusions remained suspect. Assuming such a machine could be made effective, efficient and controllable, were there still hidden dangers to be found in its operation? This question would perhaps only be answered by flying real aeroplanes.

Avro planned a progressive programme of flying models. The first stage would be low-speed trials, with a single-seat, single-engine aircraft, the Avro 707, of about one-third scale. Proving the concept at higher speeds where Mach effects became relevant would require a larger and more powerful machine, for which a twin-engine, half-

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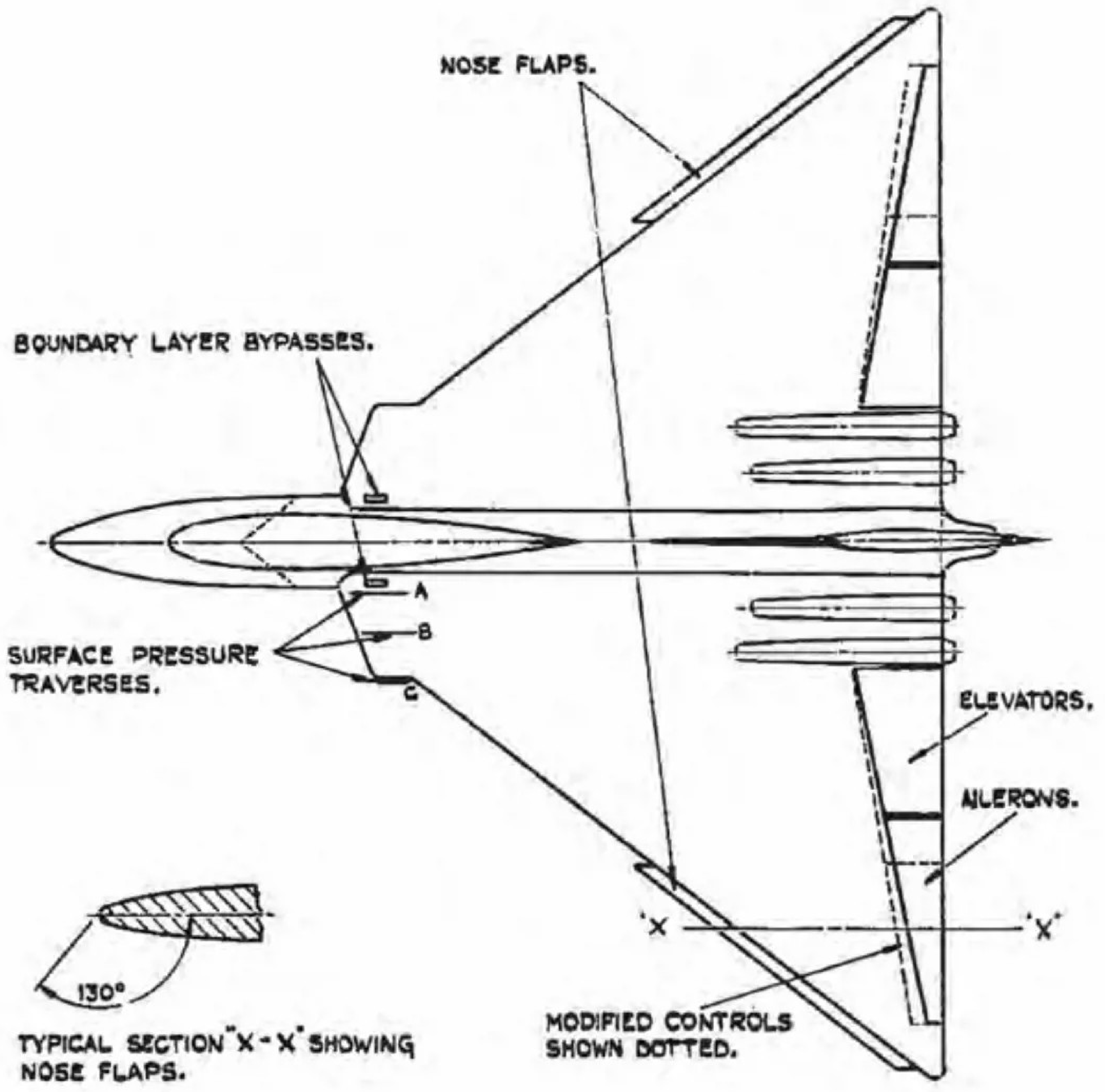

NOSE FLAPS.
BOUNDARY LAYER BYPASSES.
A
B
C
SURFACE PRESSURE TRAVERSES.
ELEVATORS.
AILERONS.
'X'
'X'
130°
TYPICAL SECTION "X-X" SHOWING NOSE FLAPS.
MODIFIED CONTROLS SHOWN DOTTED.

LEFT: A familiar but still different shape for the 698, the nose flaps and square inlets being very interesting, as it moved towards design freeze.

RIGHT: Having completed its maiden flight only days previously, on 3 September 1953, second Vulcan prototype VX777 is accompanied in preparing for Farnborough by all four of the surviving Avro 707s after the loss of the first of those smaller deltas. VX770 also joined this formation when it appeared at the SBAC show itself. ALAMY

scale aircraft, the 710, was schemed. Finally, the prototype 698 itself would be a 'flying shell,' lacking systems but able to prove the flying qualities at full scale.

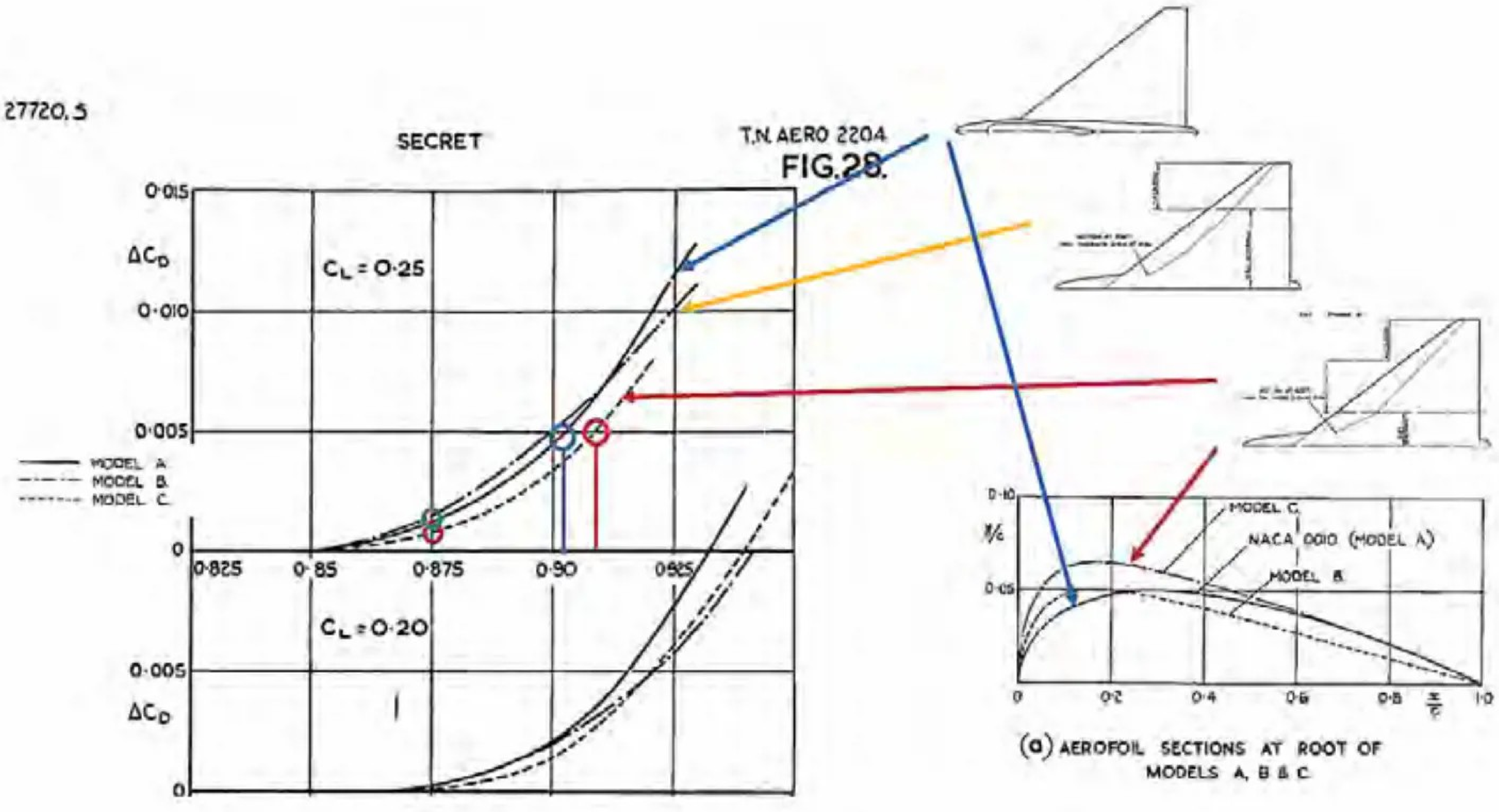
The engineering effort to make the 710 work would have been very significant, diverting precious resources and funding from the 698 itself, and the twin Rolls-Royce Avon-powered jet was axed in August 1948. Its work would be covered by a developed version of the 707, stressed to both higher dynamic pressure and Mach 0.95, approved as the 707A.

Much has been made over the years of the 707 programme's lack of contribution to the 698, on the basis that the former only flew — in September 1949 — after the design of the latter was finalised. With the sum of knowledge of delta-wing aerodynamics small, early validation of concepts was powerful. Even if subsequent redesign of the 698 was required as a result of 707 test conclusions, this at the very least accelerated their embodiment into the production bomber.

A feature of the low-speed 707B was the provision for asymmetric ballast weights to be carried in the wings, together with wingtip parachutes. These could apply known rolling and yawing moments in flight for the assessment of control power, an inappropriate role for a full-size prototype. The 707B's rolling performance was found similar to that of the Meteor, then in widespread use, and shared similar approach speed and rolling inertia. It showed that approach speed of the delta was limited by control limitations, rather than absolute lift; it could have landed more slowly and hence use a reduced field length if control power and stability were improved.

The high-speed 707A needed to be able to fly at Mach numbers beyond the planned cruise speed of the bomber, and so was stressed to Mach 0.95 and an indicated air speed of 415kt, compared with the 300kt of the original 707. It was delayed to be built to the 1949 redesign shape, using the leading-edge inlets designed for the 698, albeit

BELOW: An illustration of what was being chased by Avro, showing the benefit of the thickened, forward-biased inboard wing for drag divergence.



of course with internal ducting to suit the single Rolls-Royce Derwent VIII engine. The control surfaces adopted the final design, with the elevators in particular reduced in span to simulate the inboard region occupied by the jet pipes of the 698. It would demonstrate the existence of two problems that would unquestionably need to be solved.

Ensuring stability

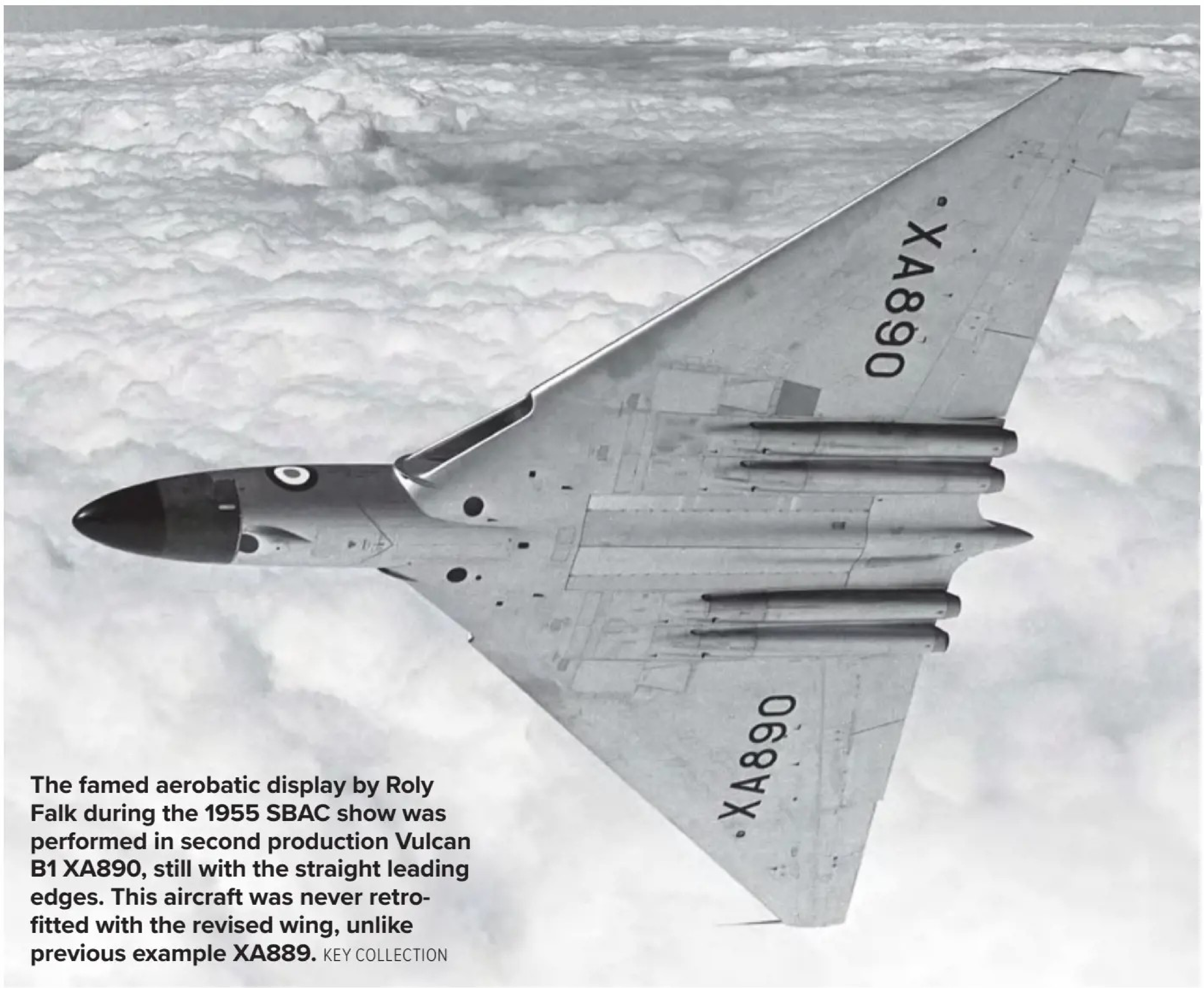
Avro test pilot Tony Blackman described how, "the [707A] aircraft exhibited an uncontrollable, although fortunately not divergent short period pitching oscillation at high Mach numbers". What did this mean? The inherent damping of the short period mode in earlier aircraft was so well expressed that the RAE would comment, "Until aircraft flew transonically [it] was normally so good that the derivatives governing it had been studied but little. Recent flight experience revealed a serious loss of damping in pitch of the short period oscillation at transonic speeds, and resulted in increased interest [in them]."

It had become apparent by the early 1950s that for a select group of wing geometries, at transonic speed the damping due to pitch rate term would change sign. The conclusion was that for, "wings of moderate aspect ratios and leading-edge sweepback of the order of 55° or less" the term became destabilising, but the addition of a tailplane suppressed this effect. For lower aspect ratios and greater sweep angles, the loss of damping did not occur, meaning the 60° sweep of the English Electric P1 for example demonstrated good behaviour though the transonic region, even when tested without a tail in the wind tunnel. The Avro 707 — and of course 698 — had landed firmly in this troublesome region, and a solution had to be found.

There would be static stability problems too, which did show up in the RAE's wind tunnel tests. Its report commented, "At higher Mach numbers however, though the aircraft is stable with respect to changes of CL at constant Mach number [...] it is unstable with respect to changes of Mach number [...] hence an increase of Mach number will cause the aircraft to pitch nosedown unless the pilot applies more up-elevator."

The task for either a human or automatic pilot was of controlling

An anti-flash white trio of B1s, led by XA907, flying from Waddington in September 1957. These aircraft were all subsequently converted to B1A standard, embodying upgrades contained in the B2. CROWN COPYRIGHT



The famed aerobatic display by Roly Falk during the 1955 SBAC show was performed in second production Vulcan B1 XA890, still with the straight leading edges. This aircraft was never retro-fitted with the revised wing, unlike previous example XA889. KEY COLLECTION

XA900
XA901
XA905
XA906

ABOVE: Some of the early denizens of Waddington's Vulcan wing: in-service B1s lined up during 1957. KEY COLLECTION

the aircraft for hours in the cruise, and needed to be made as simple as possible. The problem was glaring: wind tunnel results that might be at worst slightly pessimistic strongly suggested that at a few units of Mach above the aircraft's design cruise point, longitudinal static instability would be encountered. Avro had already proposed a solution, though, which explains the lack of panic in the narrative.

"One method which has been suggested by the firm for overcoming this instability, is the use of an automatic pilot unit to increase the elevator deflection (independently of the control column movement) by say 1/2° for every 0.01 increase in Mach number above about M = 0.87: this would stabilise the aircraft, and make the control column move forward continuously with increase of Mach number for trimmed flight at constant altitude."

The static and dynamic longitudinal instabilities close to the required cruise conditions were to be addressed in a radical manner on the Avro aeroplane: the use of auto-stabilisation systems that would both respond to the conditions and apply control inputs. A Mach trimmer would apply steadily increasing up elevator for the former, and a pitch damper that would control the elevator to react to a sensed pitch rate for the latter.

> ***"The new aerodynamic technology saved the Vulcan"***

The first phase of test-flying with prototype VX770 — beginning with a maiden flight on 30 August 1952 — showed the short period mode was indeed felt on the full-scale aircraft at altitude, at an indicated Mach number (IMN) of 0.96, which was a true Mach number (TMN) of about 0.89, within the noise of the cruise Mach requirement. The vital clearance of the auto-stabilisation systems was a major undertaking for the second prototype Vulcan, which in the winter of 1955-56 would fly more than 100 hours of appropriate tests. Five decades later, the presence of such systems in the control loop was one of the reasons the Vulcan was designated as a 'complex' ex-military type by the UK Civil Aviation Authority, leading to the need for the original equipment manufacturers to be involved in the successful effort by the Vulcan to the Sky Trust to return XH558 to flight.

Using the 'Peaky' profile

The second Vulcan prototype, VX777, was fitted from the start with Bristol Olympus engines, whereas the first had made do initially with lower-thrust Avons. This step enabled it to explore their high-altitude, high-speed environment, where a phenomenon known as buffet became obvious. With strong shockwaves forming on the loaded outboard wing surfaces, the flow separated and combined with structural modes to cause heavy vibration. As Tony Blackman would comment, "unless this buffet could be cured, the aircraft would be of no use as a bomber."

Such was the need for the Vulcan's projected capability that by now production aircraft were moving down the line at Woodford. A solution needed to be found that could be quickly retro-fitted to these machines, and it would come from the combined insight of Herbert Pearcey at the National Physical Laboratory and Ken Newby at the RAE. Pearcey is not particularly well-known, but his understanding of how to make use of the transonic flow would prove extraordinarily powerful. He reasoned the boundary between the external subsonic flow and the 'bubble' of accelerated supersonic flow over the suction surface of an aerofoil leading edge could act to reflect the expansion waves back as compression waves towards the surface. In doing so, they would slow down the air such that the inevitable shockwave further rearward could be much weaker and cost far less in terms of energy. Downstream, the flow had a chance to stay attached to the surface, rather than separating unsteadily and causing buffeting.

Newby at the RAE moved quickly, using an existing Vulcan model and incorporating extended, drooped leading edges shaped to give Pearcey's supersonic expansion — isentropic compression effect. Owing to the lift-generating suction peak that was now sustainable at the leading edge, the shape became known as the 'Peaky' aerofoil. Newby overcame many challenges, not least to detect buffet in the wind tunnel using a rigid model, which would not vibrate in the same way as an aircraft structure. He reasoned that detecting the pressure trace at the trailing edge would give him a 'surrogate' parameter, which should correlate to flight measurements.

Newby's design of an extended and drooped leading edge could indeed be retrofitted ahead of the Vulcan's main structural wing box; he had allowed Avro to engineer a viable solution. It was shown to work perfectly on the first 707A, WD280, before being fitted to the second Vulcan prototype and proving even more effective at large scale.

There is little doubt the intervention of Pearcey's new aerodynamic technology, coupled with Newby's insight into how best to use it, saved the Vulcan programme at a critical juncture. It is difficult to imagine that with production under way and an alternative aircraft available to fulfil the same role, a major structural redesign would have been viable. The Vulcan might otherwise have ended there, in 1955.

Second generation

Instead, the promise of higher-thrust versions of the Olympus, or the new Rolls-Royce bypass turbojet engine, meant even though the new bombers were yet to enter service, a second generation began to be planned. Avro schemed the 'Phase 3' Vulcan around the 15,000lb-plus new Olympus, with an all-new, thinner, 4,000-square foot wing that used similar honeycomb structural technology as the Victor, which Avro was by now developing for the 720 supersonic fighter. With nearly 40 per cent greater fuel capacity in integral wing tanks, it was expected to have a 5,000nm range and reach 56,000ft over the target. Perhaps because of the extensive changes and the risk associated with the new construction, this remained a brochure idea. However, Avro offered an alternative that would use much more of the existing Vulcan B1 wing, which might offer similar performance but without the huge increase in range.

The minimum-change, maximum-reuse thin wing was extended in span, from 99ft to 111ft, and in order to retain sensible sweep the planform increased the trailing-edge angle outboard of the second control surface line. Like the Phase 3 shape, the wingtip was of relatively long chord, so for a constant physical thickness the thickness-to-chord ratio was reduced. The tip was just 5 per cent thick as opposed to the original 8 per cent, while the LE kink — a necessity in order to incorporate the drooped, extended leading edge shape in the adapted design — it was just 4.25 per cent thick. The section through this region was reminiscent of the cut-and-shut geometry developed by Ken Newby for the Vulcan B1, but was designed in from the start using the lessons of that programme. The tip used the RAE 104 section, which moved the peak thickness rearwards compared to the RAE 101 used previously. Because it was thinner, the reduction in leading-edge sweep was acceptable aerodynamically; one parameter was traded for the other. A second important effect was that the vortex generators on the upper wing surface, a band-aid to postpone shock-induced separation, were no longer required.

The common inboard wing meant Avro was able to conduct full-scale testing using VX777 as early as 1957, whereas the first time the Victor B2 wing was flight-tested was on the first production jet, XH668, in February 1959. Although it would be July 1960 before the RAF received the Vulcan B2, it basically worked 'out of the box' and build-up of the force was rapid.

Blue Steel and beyond

The work of the 'V-bombers' would — in theory — have become simpler from the later 1950s, with the advent of the Blue Steel missile allowing

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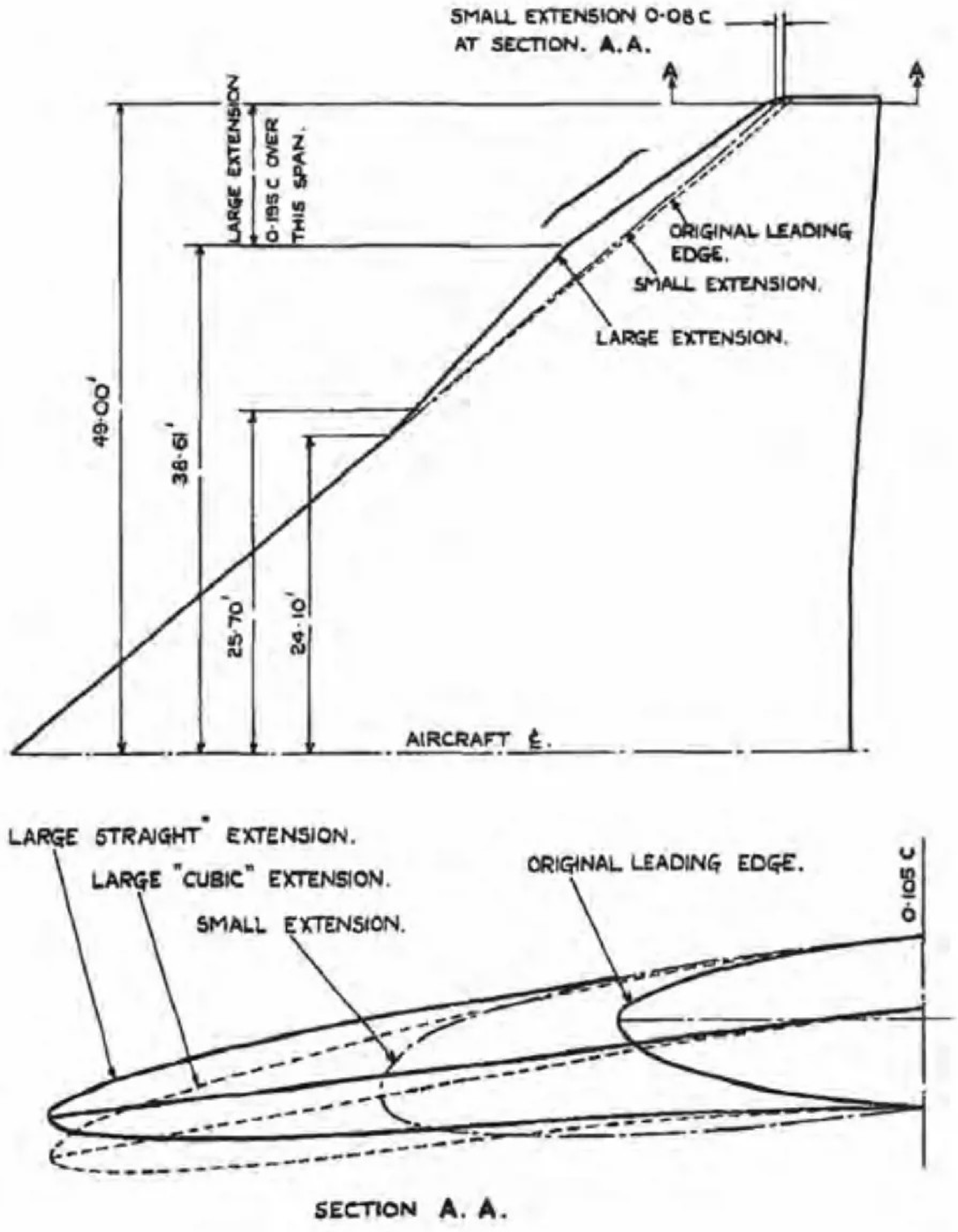
BELOW: The RAE's diagram showing the leading edge options developed to address the Vulcan's high-Mach buffet problem, one of the earliest drawings of the new shape.



ABOVE: Scampton-based No 27 Squadron B2 XL445, which was delivered in late 1962, demonstrating its Blue Steel-carrying capability. CROWN COPYRIGHT

weapon launch about 100nm away from the heavily-defended targets. Flying at Mach 3 and boosting up to circa 70,000ft, it was nonetheless considered that this would be vulnerable by the early 1960s. As the American Hound Dog missile showed, it could have sidestepped many of the problems that caused its entry into service to be delayed to 1962, had it not been based upon a stainless steel airframe and rocket power. Like the Victor, perhaps the Blue Steel programme had concentrated on the future to the detriment of the present.

There was a better answer. With the shock of Sputnik passing overhead, the United States was once more open to working with the UK on nuclear weapons by 1958. By this time, solid rocket technology, which did not require the very careful handling of the liquid-propellant Blue Steel and was much more suited to the quick reaction alert scenario, was a reality and an air-launched missile was under consideration. The UK was involved from the start of what would become the GAM-87A Skybolt, a ballistic missile that could be fired from 1,000nm away and impact its target from a maximum altitude somewhat greater than 200 miles above the earth, a little over 12 minutes later.

The missile was small enough that two could be carried easily by a 'V-bomber,' under the wings. To replicate the 144 free-fall warheads of the existing plan, just 72 bombers would be needed. In 1960 when the Cabinet came to make the decision on Skybolt, the Vulcan B2 was about to enter service, with 12 aircraft flying or close to being so. The Victor programme had lagged behind and was beset with engine integration problems with the new Rolls-Royce Conway. Crucially, the need for such high performance had lessened; the missile itself would take up the slack and could be launched over the North Sea. The proposal put before the Cabinet and agreed was that the Vulcan would carry Skybolt — the future deterrent into the 1970s and beyond — while the Victor would support with Blue Steel. Once again, the Vulcan's simplicity, robustness and reliability had come to the fore.

What we got — and what might have been

Avro's philosophy stretching back to the Anson and Lancaster had always involved simplicity and ease of manufacture. For the B35/46 bomber, it was abundantly clear there would be unexpected problems to solve along the development path, and the simplicity of the delta layout was a way of avoiding a large tranche of known difficulties, leaving capacity to deal with the unknowns as and when they arose.

In absolute performance terms, the Victor's advanced aerodynamic concept always brought better altitude and range, but that only mattered if it physically existed and was in service. A workable Vulcan was in the wind tunnel a year before the Victor, and delivery to the RAF of the Handley Page bomber was delayed even further. The 'V-bombers' were thought likely to be viable to 1965 at the latest prior to being replaced by Blue Streak, so this represented a significant proportion of the jet's planned life. The Vulcan's concept had its limitations — it could not realistically go any faster than it did, for example, whereas a more powerful, developed Victor could have been supersonic, but it met the specification in a timely manner. The Phase 3 version is an intriguing might-have-been and would very likely have outperformed the Victor B2, but then again, only if its complex structural technology had been realised in time. We shall never know.

What we almost had, from 1965, was a fleet of transonic, high-altitude bombers equipped with air-launched ballistic missiles — a sub-orbital spacecraft — and able to land megaton-range warheads on Soviet cities from over the North Sea. The potential new-build, enlarged 'V-bombers' like the Vulcan Phase 6 seem extremely unlikely to have been proceeded with, as the UK government had already invested in the VC10 of a similar maximum take-off weight class, implying it would have been used instead. The Vulcan B2/Skybolt combination is a closer 'what-if' than even the deployment of the TSR2; it made strategic sense and met the defence priorities of the UK. The same Cabinet meeting that approved it, however, also discussed the use of Holy Loch for the US Navy's Polaris submarines, and what that might mean in return.

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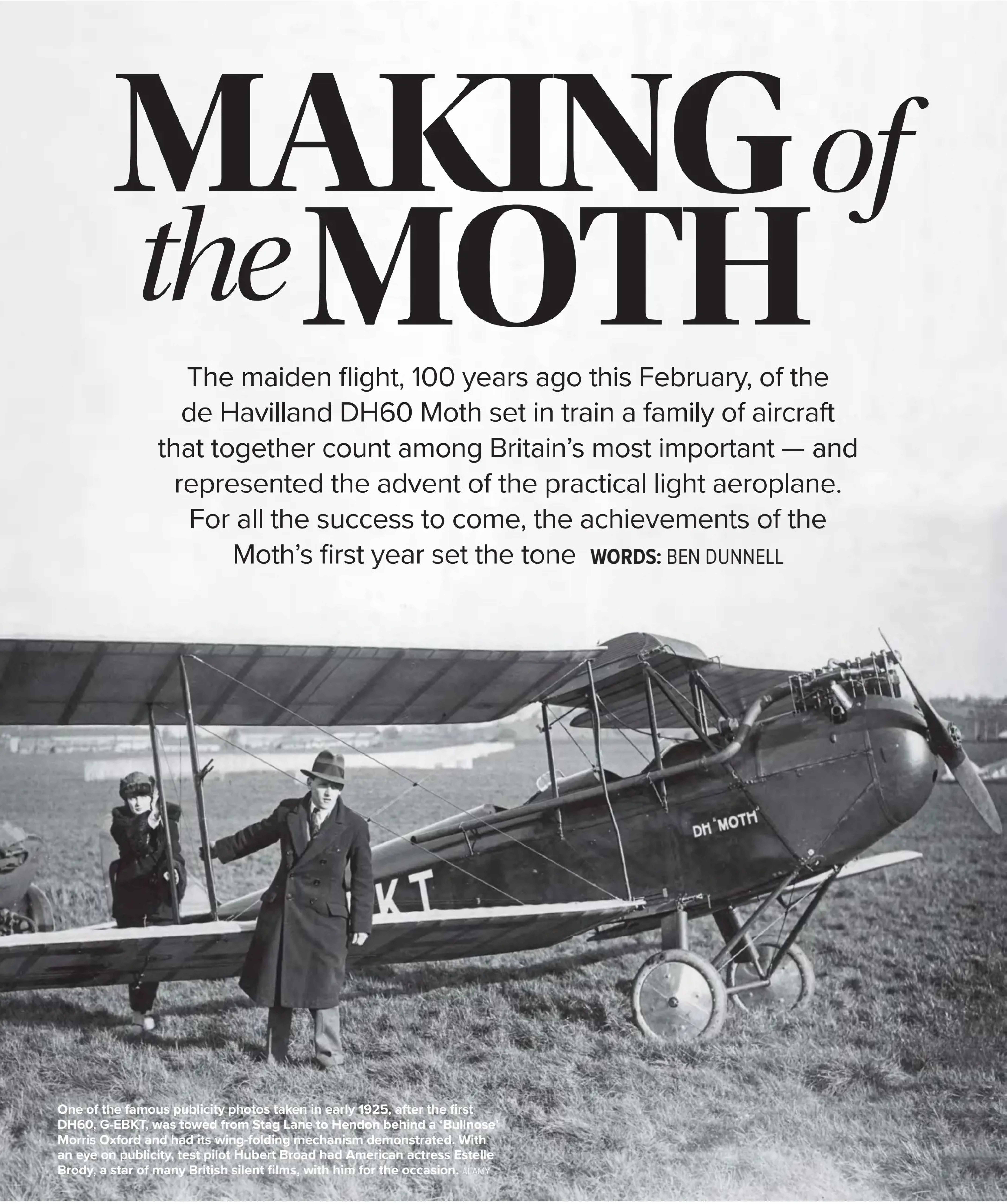
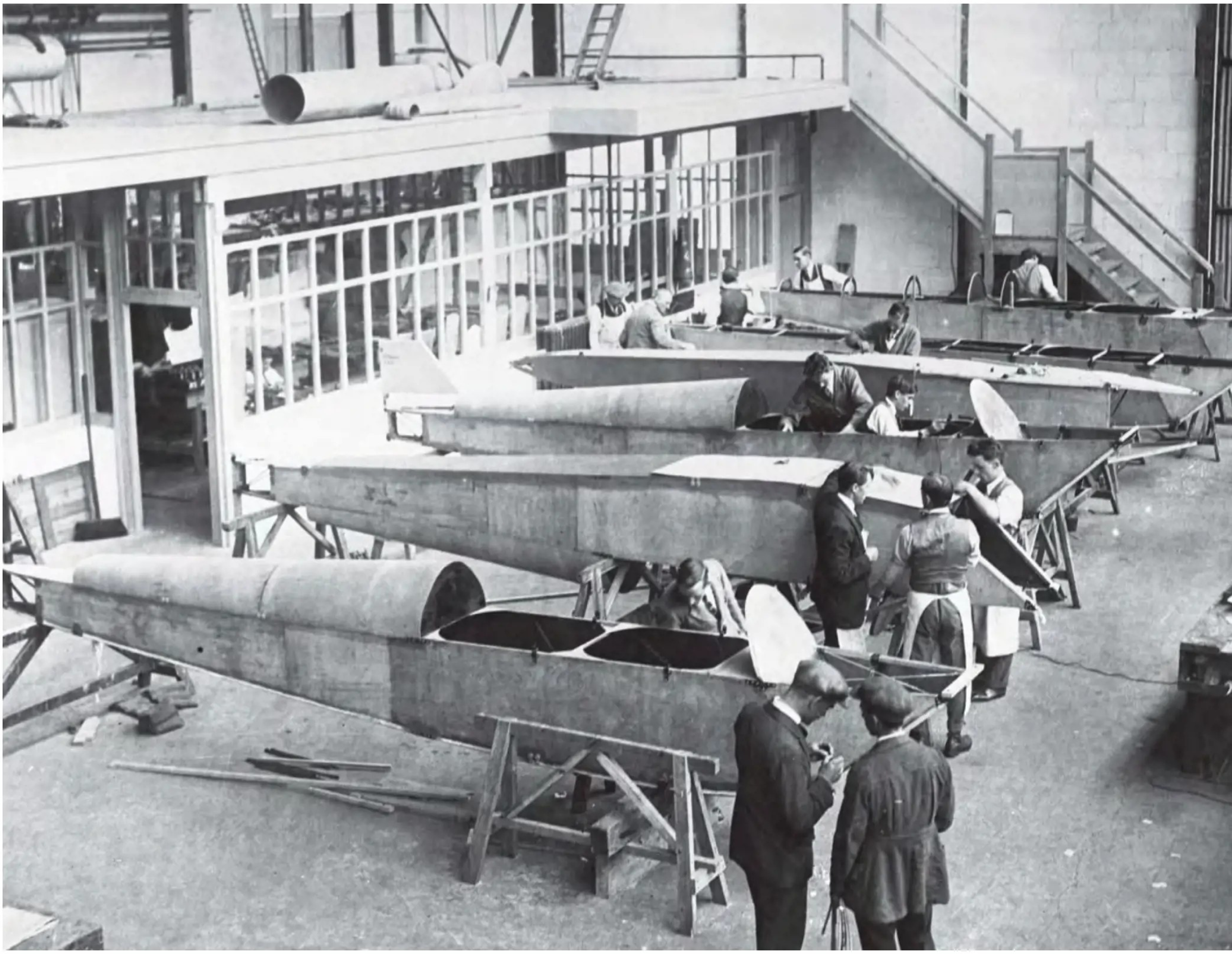
MAKING *of* *the* MOTH

The maiden flight, 100 years ago this February, of the de Havilland DH60 Moth set in train a family of aircraft that together count among Britain's most important — and represented the advent of the practical light aeroplane. For all the success to come, the achievements of the Moth's first year set the tone **WORDS:** BEN DUNNELL



One of the famous publicity photos taken in early 1925, after the first DH60, G-EBKT, was towed from Stag Lane to Hendon behind a 'Bullnose' Morris Oxford and had its wing-folding mechanism demonstrated. With an eye on publicity, test pilot Hubert Broad had American actress Estelle Brody, a star of many British silent films, with him for the occasion. ALAMY



ABOVE: **Early DH60 fuselages being manufactured at the Stag Lane plant in Edgware.** GETTY

"The DH60 (the Moth) fitted with the Aircraft Disposal Company's Cirrus engine, made its first flight at Stag Lane on Sunday afternoon. Capt Geoffrey de Havilland took it up for the first test and then, with Mr Broad as passenger, he made a more extended flight."

That, on 25 February 1925, was *The Aeroplane*'s first report on an aircraft that was to change the face of light aviation — and which it would chronicle in depth, not least during that first year. In taking to the air from de Havilland's north London factory airfield three days earlier, DH60 G-EBKT had lived up to its manufacturer's expectations, as expressed in a series of prominent press advertisements. "The DH two seater light aeroplane", one proclaimed as of January, "is now in an advanced stage of construction and will be flying early in March". Another stated, "Simplicity, robustness and ease of handling and maintenance are features which have been most carefully considered in its design", adding how the Moth, "will not be a delicate and frail craft requiring highly skilled attention. It will be as sturdy and lasting as the modern Light Car". The firm — and especially its business manager Francis St Barbe — knew the commercial value of generating good, straightforward publicity.

> ***"Without a suitable motor, the project would have stalled"***

Much more was to follow as the Moth proved its worth. Only a slight fluctuation in revolutions on the part of the ADC Cirrus I engine, another new product, deviated from the trouble-free nature of that maiden sortie. Development of that powerplant by the Aircraft Disposal Company, under the leadership of Frank Halford, was key to the success to come. Without a suitable motor, the project would have stalled at the first hurdle. *The Aeroplane* covered that, too, in the edition mentioning the first flight.

"A new Airdisco engine, known as the Cirrus, has recently been produced to meet another type of demand. This is a four-cylinder vertical using the cylinders and certain other components of the Airdisco 120hp [which had been used in de Havilland's larger DH51]. It is rated at 60hp at 1,800rpm, with a maximum of 65hp at 2,000rpm.

G
G-EBKT
MOTH

RIGHT: **A clod of mud appears to have been picked up by G-EBKT's tailskid, probably at Stag Lane.** ALAMY

Major F. B. Halford, of BHP [Beardmore-Halford-Pullinger] and Puma fame, has been responsible for this as for the previous Airdisco, and it is safe to predict that this new engine will prove to be one of the most reliable and serviceable of all the aero-engines yet produced.

"The Cirrus is not intended to compete with the very light type of Light Aeroplane engines which are now in the experimental stage, but rather to provide an immediate solution to the demand for an engine which can be used for two-seater machines of a much more economical type than the standard class of training and touring machine. The engine is admittedly heavy — its weight is 260Ib or 4.33lb per hp — which in point of fact compares not unfavourably with the power/weight ratio of certain much smaller light aeroplane engines— particularly such as have had the benefit of Air Ministry supervision in design.

"As is well known the Cirrus engine has been fitted to the DH Moth two-seater which is essentially a light aeroplane as the loaded weight is only 1,350lb. The machine can confidently be expected to give an exceedingly satisfactory all-round performance…

◆

"The cylinders are of cast-iron with detachable aluminium alloy heads and overhead valves. Aluminium alloy pistons are fitted, and as the crankshaft is identical with that of the eight-cylinder engine an extremely long life may be expected from crankshaft and big end bearings. A properly designed self-contained lubricating system is employed, the carburettor is a Zenith with an exhaust heated air muff on the exhaust pipe. A hand-starter of ratchet type similar in principle to the kick-starter of a motor-cycle, together with an impulse magneto coupling, are fitted as standard, which will make it possible to start the engine from the pilot's seat without trouble.

"This engine should solve the problem which is now vexing the promoters of light aeroplane clubs by providing a reliable and cheap power plant for two-seaters. A lower total weight would be an undoubted advantage, and it is certain that when a sufficient demand for engines for this purpose arises Major Halford and the Aircraft Disposal Co will find no serious difficulty in producing an engine of similar output and greatly reduced weight without sacrifice of reliability or simplicity."

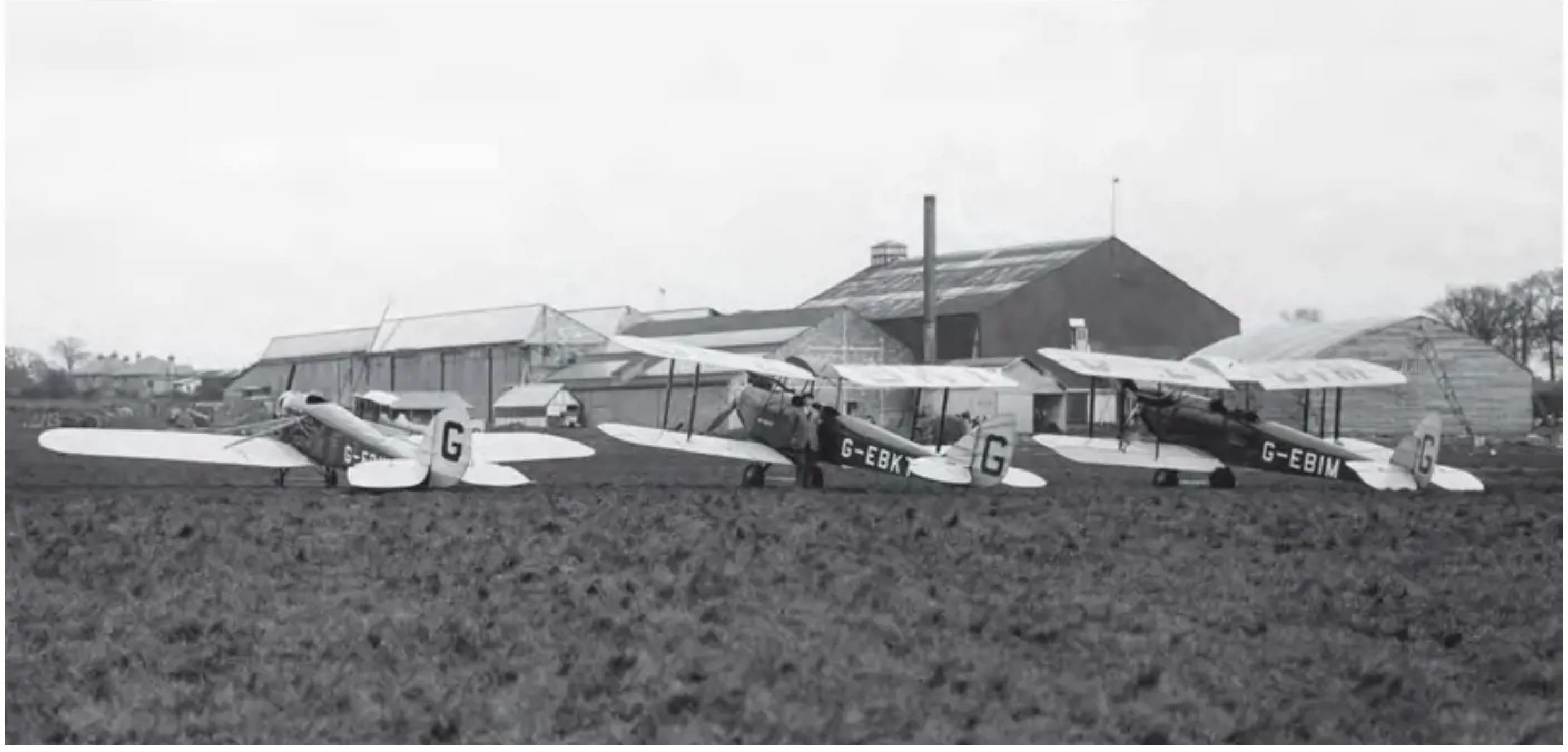
An inaugural press presentation of the DH60 took place at Stag Lane on 2 March, with company test pilot Hubert Broad at the controls, and was described in *The Aeroplane* two days afterwards.

"[Despite] extremely bad aerodrome conditions, Mr Broad took a number of distinctly heavy passengers into the air with extreme ease. The Moth has been described as a light aeroplane, and in fact it is light, but it is scarcely of the type which has hitherto been meant by that term, and its performance, with full load, puts it on a level with much heavier and more powerful types.

"It is perhaps fair to say that Capt de Havilland had in mind the desirability of at once producing a machine which will do now what those who believe in the light aeroplane hope the latter will be able to do in time. In this he appears to have succeeded admirably.

"The Moth is a perfectly normal biplane — at a distance and in side view it might easily be taken

BELOW: **In the month of the Moth's maiden flight, February 1925, G-EBKT was lined up between two other de Havilland light aeroplane offerings: the DH53 (left), which was still being actively marketed at the time with its economy to the fore, but was clearly too small, and the DH51, which was clearly too big.** BAE SYSTEMS



for a DH9 much further away. The fuselage is of the standard DH three-ply covered type, with a domed top, carrying pilot and passenger in tandem — one below the centre section and one behind the wings. Both seats have controls, those of the front seat being removable, and a speaking tube is fitted so that the occupants may converse easily — particularly when the machine is being used for instructional work.

"The engine, which is the 60hp ADC Cirrus described in the last issue, is supported directly by the top rails of the fuselage, and is isolated from the cockpits by an inclined fireproof bulkhead.

"The wings are of equal span and chord, slightly staggered, and have a uniform dihedral. The centre section, which contains the fuel tank, is supported, as to its front spar, by a pair of inverted Vees of oval-section steel tube, which renders cross-bracing unnecessary in the side panels, and allows free entrance to the front cockpit. The wings fold about hinges at the inner ends of the front spars. The rear spar of the bottom wing is dropped below the fuselage so that when folded the trailing edge passes under the body, and the machine has then a maximum width of 9ft 8in. There is one pair of spruce interplane struts per side and streamline wire cross and incidence bracing is used.

"The undercarriage is precisely similar to that which has been used on the majority of recent DH machines. An axle is carried by a pair of hinged struts raking backwards from below the engine compartment and is supported by a nearly vertical telescopic member in which rubber in compression serves as a shock-absorber.

"The controls are of the usual stick type, and when the front stick is removed, a hinged aluminium trapdoor covers the socket and all moving parts so that a careless passenger cannot jam the gear with his feet. Adjustable pedals are fitted to the rudder bars, and there is enough leg room in both cockpits to give plenty of space for the largest passengers. The domed top of the fuselage comes well up over the shoulders, and with the aid of an adjustable windscreen, the occupants are unusually well screened from draughts.

"The engine — which runs extremely smoothly — is fitted with a long exhaust pipe, and it is so silent that it is quite possible for the two occupants to communicate without the aid of the speaking tube.

"No accurate performance tests have yet been made on this machine, but the tests so far made — with an airscrew which does not permit the engine to develop its full power — indicate that the machine has a better performance than is indicated in the specification.

"The Moth, even in the present waterlogged state of the aerodrome, takes off quickly, and climbs really fast. She obviously handles extremely easily, performs all the usual stunts (in the hands of Mr Broad) in an exemplary manner, and lands very slowly. She is undoubtedly a thoroughly practical training machine and should certainly meet the needs of the Light Aeroplane Clubs, and that of the private owner."

> **“It was a joy to fly in all weathers, as proved in a strong wind”**

Those clubs agreed. On 16 April a meeting of their representatives took place at the Royal Aero Club in London, the aim to decide on the standard equipment they would buy using financial grants from the Air Ministry. Their choice fell upon the Cirrus-engined Moth, two of which — along with one spare powerplant — would go to each of the Lancashire Aero Club, Newcastle Aero Club and the Light Aeroplane Section of the Royal Aero Club, with the requirements of the Midland and Yorkshire Aero Clubs to be notified later.

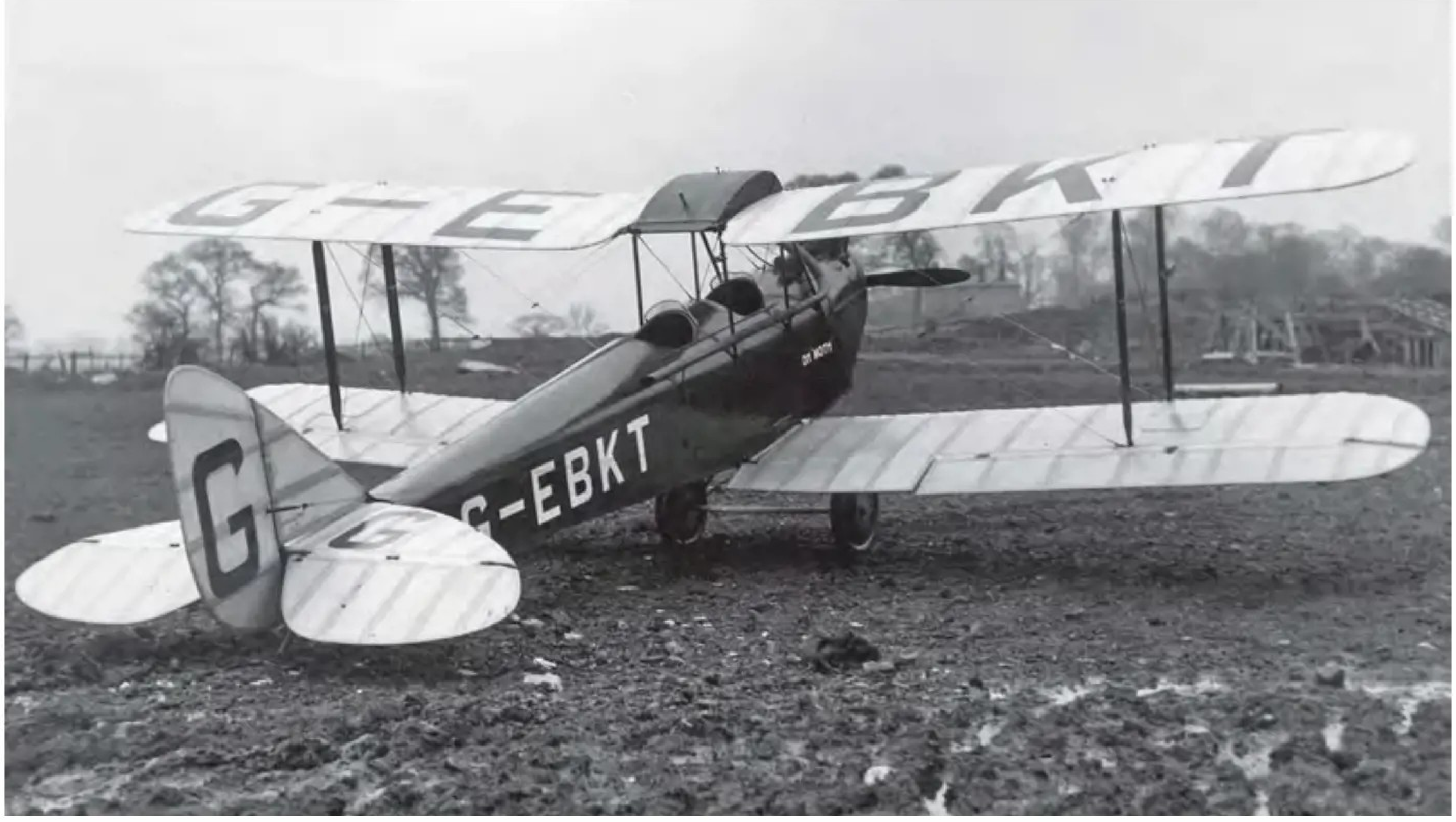
In the meantime, one of *The Aeroplane*'s correspondents was given the chance to flight-test the first DH60, an experience written up in the 22 April edition.

"The two points that impressed themselves immediately on [the author's] mind were the comfort in handling of the controls and the complete adequacy and reserve power of the engine.

"Owing to the very efficient silencing, one was, for the first time in one's experience, not left in the temporarily deafened condition which is the result of flying without helmet, and conversation between the two cockpits should be quite possible, even with the engine 'all out,' without the usual head-phones.

"The first surprise was during a short flight with Mr Broad, when one found that in spite of the fact that the ailerons are only fitted to the lower planes, the machine is very sensitive laterally. It is consequently a joy to fly in all weathers, as was proved on the following day, when a strong wind was blowing, and one had the opportunity to test it to one's own satisfaction. Though the weather was reputed to be very bumpy, the bumps were scarcely felt at all, owing to the ease with which they could be corrected.

"Admittedly as a training machine the Moth will be no encourager of the ham-fisted type of pupil. But pilots trained on this machine will have the enormous advantage of acquiring from the start that



ABOVE: With a wet winter, Stag Lane aerodrome didn't end up in the best state, but the new DH60 coped admirably with the conditions. BAE SYSTEMS

Alan Cobham contributed much to the early Moth success story. This was probably after his 29 May flight to Zurich and back, a journey which involved a roughly 1,000-mile round trip — good for advertising purposes. ALAMY

DH 'MOTH'
G-EBKT

Broad and Brody unhitch the Moth from its Morris means of road transport. ALAMY

lightness of handling which, it must be confessed, was very difficult to impart to pupils on the heavy-handed instructional machines which were formerly so much in use. ('Avros' are not referred to here.)

"As a convincing proof of the reserve power of the engine one found that the machine looped easily at something less than the maximum level flying speed, flown solus. And, although there was not time to test it for ceiling, the climb was quite fast enough to satisfy the writer's requirements which were to find a really satisfactory instructional aeroplane which was also economical in fuel and upkeep.

"As expected, stalling the Moth leads to no alarming drop but merely to that slight 'sinking feeling.' Which is not surprising, as she is controllable at 40mph.

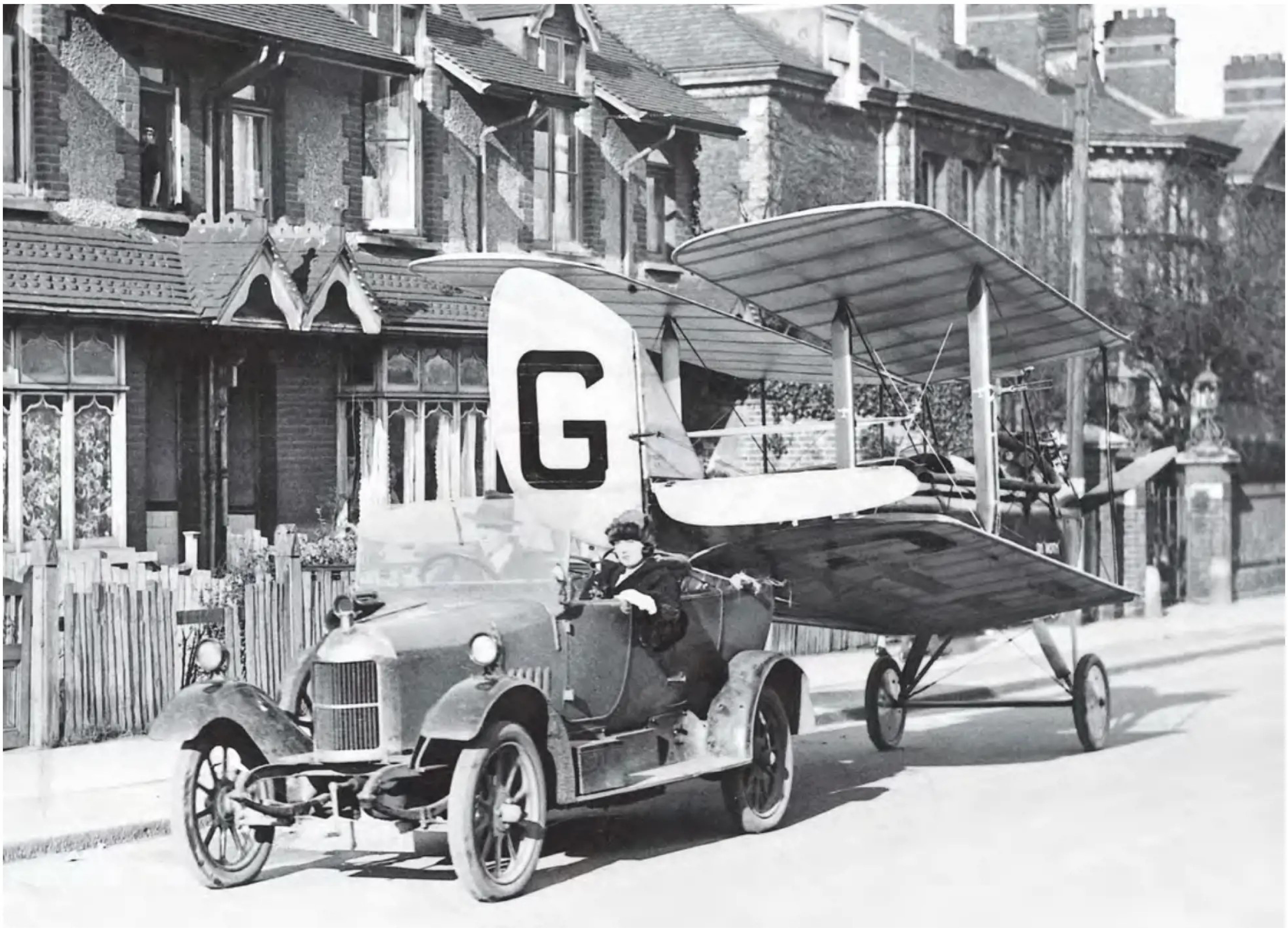
"When coaxed into a spin she spins fairly fast, owing to the short span, but a straightened rudder brings her out instantly. An adjustable spring on the joy-stick, fore-and-aft takes the place of the adjustable tail usually found on large machines, so that for touring purposes the machine is as suitable as for instructional.

> ***"For touring purposes it is as suitable as for instructional"***

"It will be as well for the writer to state that he has no interests in the production of this or any other aeroplane but that he went to criticise and can do nothing but praise. Of this machine he would say: 'From such stuff are Pilots made.'"

It fell to Alan Cobham in G-EBKT to undertake the first real demonstration of the DH60's performance, as described by Geoffrey Dorman — a former Royal Flying Corps pilot who, incidentally, went on to become an active member of Oswald Mosley's British Union of Fascists and the subject of much official attention — in *The Aeroplane* for 3 June 1925.

"On Friday last Mr Cobham made a very fine flight from London to Zurich and back in fourteen hours



ABOVE: **The period caption for this delightful image of G-EBKT's journey between Stag Lane and Hendon read, "Holiday travel with a transportable aircraft."** ALAMY

on the de Havilland Moth with the Aircraft Disposal Company (or Airdisco, as it is now called for short) Cirrus engine. He left Croydon at 04.56hrs, and reached Zurich at 11.00hrs. He left again at 11.45hrs, and reached Croydon at 19.30hrs. Mr Cobham's speed on the outward journey works out at 82mph, and the homeward trip was made at an average of 64mph.

"Mr Cobham's flight was done, as he told one before the start, to 'get the public', and as a piece of propaganda it was excellent, especially as it was shared by all the papers, and not made, as are so many of Mr Cobham's yarns, exclusive to a single paper.

"In all that publicity there were bound to be a few errors. For instance, it was not, as was freely stated, the first return flight between London and Zurich in the day. Mr Rogers performed that feat some time ago on the ordinary daily service without knowing he was going to do it beforehand. Also it was not the longest non-stop flight in a light aeroplane. Mr Bert Hinkler, in 1920, flew non-stop from Croydon to Turin, which is 700 miles, and the following year he flew from Sidney to Bundaberg, in Australia, a distance of 800 miles non-stop. Both these feats were done in a Baby Avro with a 35hp Green engine. The Green is lighter and develops less horse power than the Cirrus, though its cylinder capacity is some 10 per cent greater, and so the machine can claim to be a light aeroplane of the Moth class.

◆

"One wishes that the daily papers would boom other good flights the same as they do those of Mr Cobham. Mr Cobham realises that before the public can be made to take up flying they have got to be educated in the safety, ease and utility of flying. Many people object to publicity, but Mr Cobham does not. Therefore he is setting out to educate the public and when the public starts to travel by air and to buy light aeroplanes much of the credit for having induced them to do so will belong rightly to Mr Cobham. His valuable work will always be recognised in this paper, and at the same time his equally valuable leg will always be pulled."

Another valuable opportunity for de Havilland to demonstrate its products in the public eye was the annual King's Cup air race, held in 1925 on 3-4 July as a round-Britain affair starting and finishing at Croydon. *The Aeroplane*'s editor C. G. Grey was on hand.

"The first machines away were the two de Havilland Moths with Cirrus ADC engines, one [G-EBKU] piloted by Capt Geoffrey de Havilland himself, who had also entered the machine for the race, and the other [G-EBKT] by Mr Alan Cobham and entered by Sir Charles Wakefield of the Castrol firm, who may always be regarded as a certainty whenever financial support is wanted for a flying event, whether he wins or not. Both the Moths, each with a passenger, got away in very good style…

"All the earlier starters were forced to land by fog to the north of the Thames. The fog was not in fact a real fog at all, that is to say it was not caused by any inter-action between the ground and the atmosphere, it was simply what the North-country people call a 'sea fret,' blown in from the North Sea by an east wind, and apparently caused by a fight between an area of low pressure centred over Germany and an area of high pressure with its centre somewhere to the west of Ireland, the warm air of the high pressure area causing condensation in contact with the cold air of the low pressure area. But the net result was as thick a fog as one usually meets in November or thereabouts.

"The first news was that Capt de Havilland and Mr Cobham had landed close together near St Albans and that Col Sempill [in a DH51, G-EBIQ] was somewhere in the same area. Apparently the all-pervading North Sea cloud was more efficacious than that which used to lie in wait for Mr Cobham in Alps and Pyrenees and such places. Anyhow this one was too big for him to dodge."

Another, more extensive DH60 flight test in *The Aeroplane* for 2 September 1925 backed up the favourable opinions expressed hitherto.

"The front (passenger or pupil) seat, is extraordinarily comfortable and roomy, and astonishingly free from draughts. On this particular flight the seat cushion was low enough to keep the top of one's head below the top of the wind screen. That position is really too low for instruction purposes, as the view forward is too much restricted, but for teaching purposes a higher cushion is normally provided. For passenger-carrying work the low-seat position is ideal.

"The Cirrus engine runs extremely sweetly and with an astonishing freedom from vibration, and with the standard exhaust pipes is quite effectively silenced. The get-off and the initial climbing angle of the Moth is astonishingly good — it is much more impressive when one is in the machine than it looks from the ground, and even from the ground it looks remarkable.

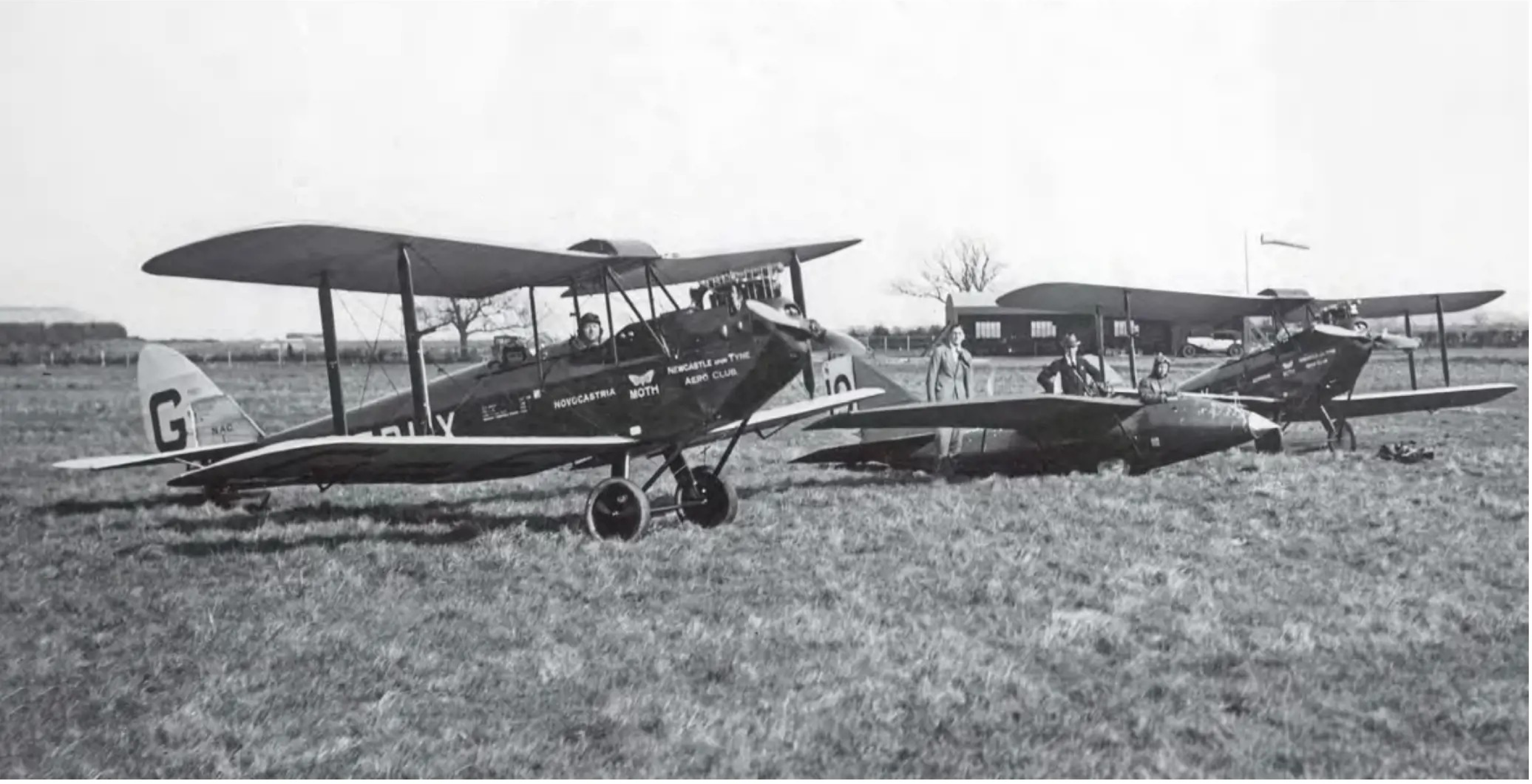
> *"As a trainer the DH60 ought to be extraordinarily satisfactory"*

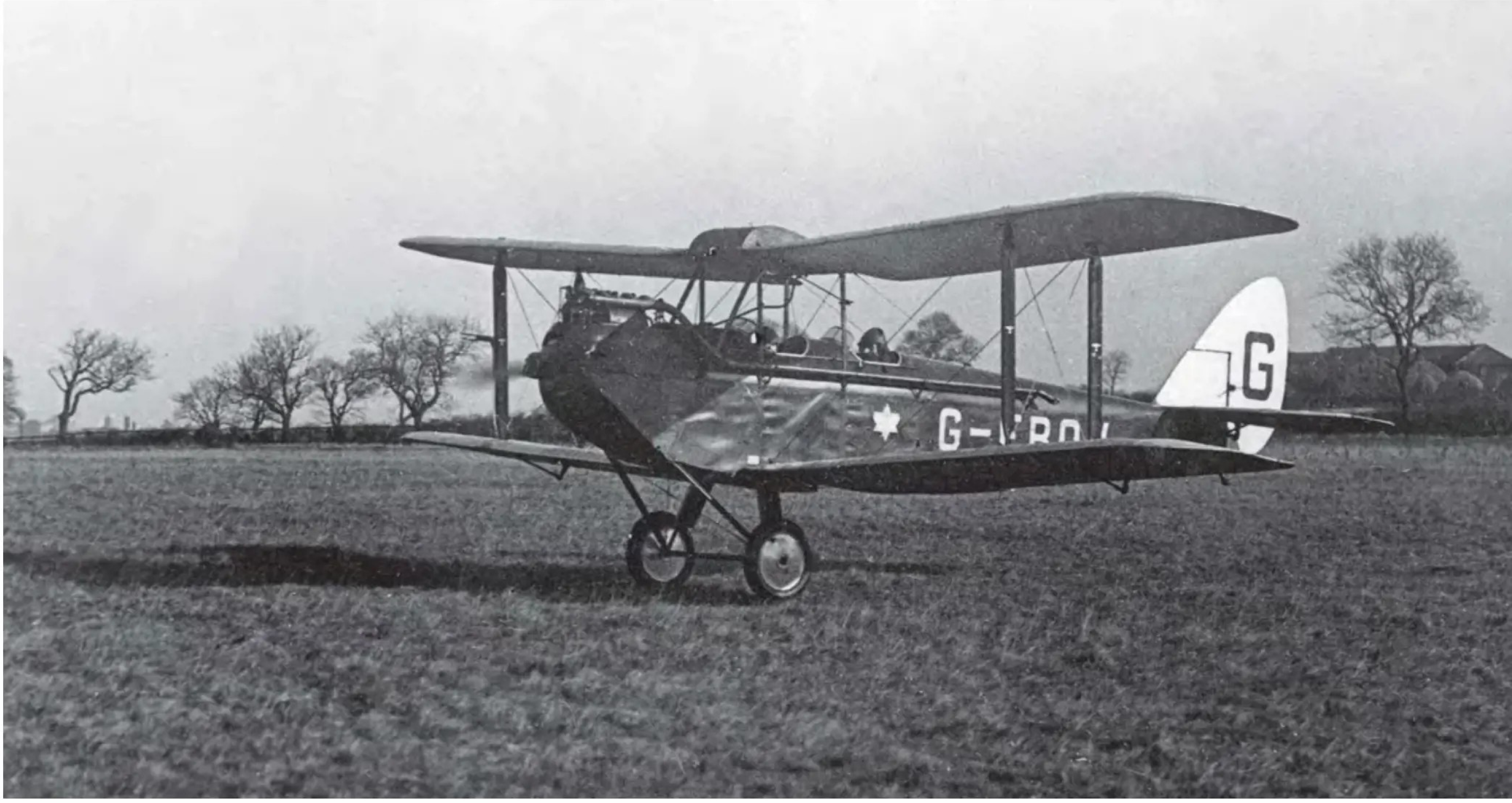
"In the air the Moth is quick and sensitive. The day on which this flight took place was exceedingly hot and stuffy with a fluky wind, which never blew twice from the same direction. Bumps were frequent and quite severe. Even under those conditions the Moth was by no means difficult to keep under reasonable control even to one of very limited experience and badly out of practice. Response to control movements of all kinds is immediate and definite, but whether the movement of the machine is provoked by control or by external disturbance, that movement is free from any trace of disconcerting abruptness.

"The first impression after taking over the control was that one was about to make an awful hash of the attempt to fly. This impression was based on previous experience only of considerably heavier and more sluggish types, and would probably not affect pupils with no previous flying experience. Actually only a very short time was required to get the feel of the controls and to use them with reasonable delicacy.

"As an elementary training machine the Moth ought to be extraordinarily satisfactory. It might be imagined that her quickness would render her too difficult for many pupils — but it is much more probable that this will prove to be a positive advantage. The quickness seems to be entirely dissociated from any unpleasant qualities and the pupil who stirs his stick too vigorously at first will only receive somewhat more unmistakable evidence of the fact than he would obtain on a more sluggish mount.

BELOW: Typical of the early club Moths were these two examples for the Newcastle upon Tyne Aero Club at Cramlington, G-EBLX *Novocastria* and G-EBLY *Bernicia*. Delivered during June 1925, they were acquired as a result of the Air Ministry grant. Between them is the second of the two Gnosspelius Gulls built, which was owned by a syndicate of three club members, and crashed fatally in June 1926. ALAMY





ABOVE: **Another Newcastle club DH60, G-EBQV, shows well the high-mounted Cirrus engine of the initial aeroplanes as it starts its take-off roll.** ALAMY

Possibly he will take a little longer to hit off just the right touch for the Moth than he would require for other types, but if he ever learns to fly the Moth well he will at once be able to handle Avros and the like. The reverse will not necessarily be true.

"And it may be said that there are many distinct off-sets to the quickness of the Moth, even if that were believed to be a drawback. The pupil's cockpit, as has already been mentioned, is comfortable, and the engine runs beautifully smoothly and quietly, and there is little or no draught. A pupil attempting to control an aeroplane for the first time is pretty certain to be feeling somewhat nervous, and any unnecessary noise, vibration or discomfort, must add to his nervousness and hamper him in giving his whole attention to the job in hand.

"The relative freedom of the Moth from such distracting phenomena may well permit pupils to get the feel of the controls even more rapidly than they would do on a slower but noisier and less comfortable machine.

"It is quite useless to teach people to fly a machine that is too slow or too insensitive, and particularly under present conditions, it is desirable that there should not be too many persons trained to just fly an easy machine passably. It is very much more desirable that the new Flying Clubs — if they turn out any pilots at all — should train a reasonable number who will make really good pilots than a larger number of mediocre or bad ones.

"And although there is very little doubt that quite a poor pilot could be taught to fly the Moth with reasonable success, the fact that that pilot was not good would be made very obvious — at least to his instructor — by the inherent qualities of the machine itself."

The year concluded with news in the 30 December edition of a further impressive Moth undertaking.

◆

"So many fine flights have been accomplished on the de Havilland Moth that nowadays on hearing that such a flight is to begin one merely awaits its conclusion without expecting any incident.

"On Wednesday last Colonel the Master of Sempill left Stag Lane at 10.00hrs for Dublin on a Moth. He carried with him four tins of petrol. He alighted at Shotwick and refuelled and then flew to Holyhead. Here he landed in a field and refuelled from the tins he carried. He then flew straight across Lt Col Robert Loraine's private airway to Dublin, which is a 60-mile sea crossing. He encountered two heavy hailstorms, in spite of which he made landfall at Kingstown and landed at Baldonnel after 4 hrs 45 mins' flying.

"Here Col Russell, the C-in-C of the Free State Air Force, and three of his officers flew the machine and expressed great satisfaction with it.

"The Master of Sempill then picked up Sir Sefton Brancker [the UK's director of civil aviation, who had been instrumental in the aero club scheme] and flew to Belfast. He is making the return flight this week.

"The Master of Sempill's fine navigation and his confidence in the Moth and the ADC Cirrus engine in flying in bad weather across 60 miles of sea are particularly notable. All parties concerned deserve congratulations for a very fine flight."

Everything written about the DH60's qualities 100 years ago held true; these were no over-excited proclamations about a new British aircraft. It went on to become, simply, *the* light aeroplane of its generation, testament in particular to Geoffrey de Havilland's belief that this — rather than some of his other, more compromised creations — represented the correct design for the genre. Seldom has an aircraft been so right from the start. And the scene was set for many more achievements as the Moth matured.

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The cover of the January 2025 issue of Pilot magazine features the Bristell Taildragger. Deleting the tricycle undercarriage nosewheel and fitting a tailwheel makes the lovely Bristell kitplane/Light Sport Aircraft even nicer – and better suited to strip flying.

Also featured is a day in the life of an A350 captain when Mawgan Grace takes a seat alongside the flight crew in the cockpit of a Cathay Pacific A350 for a long-haul trip from New York to Hong Kong. Plus, there's a first look at CubCrafters' Carbon Cub UL which sees Super Cub made Ultra Cub – and potentially a UK microlight with STOL performance to spare.

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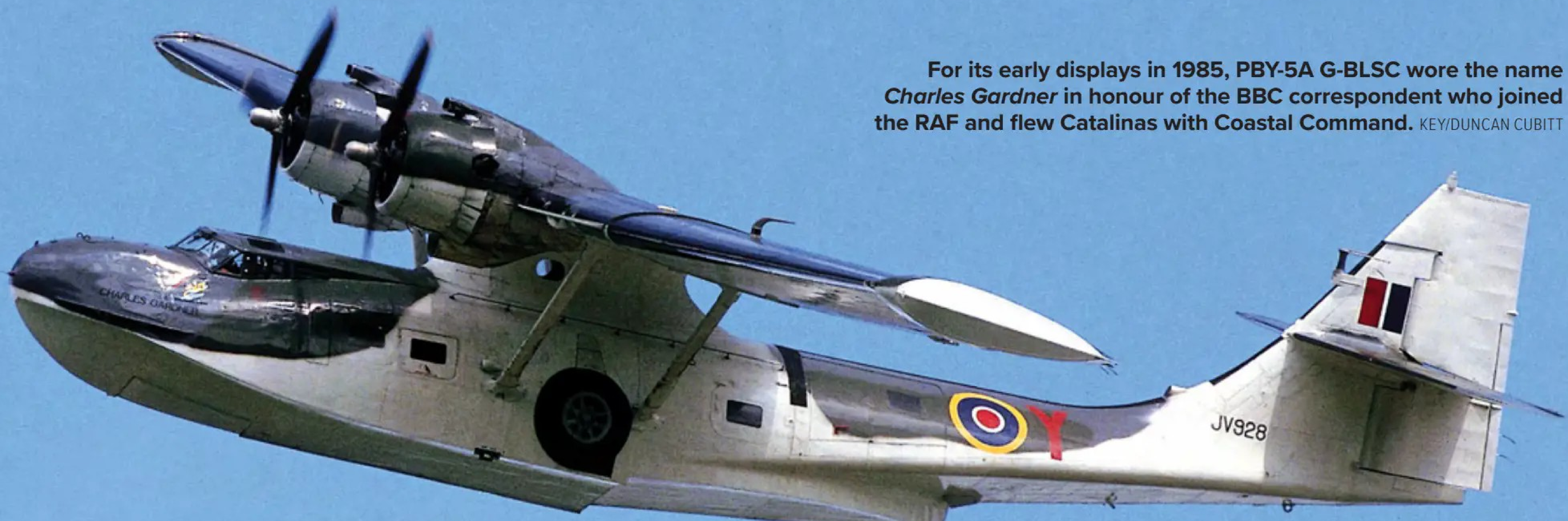
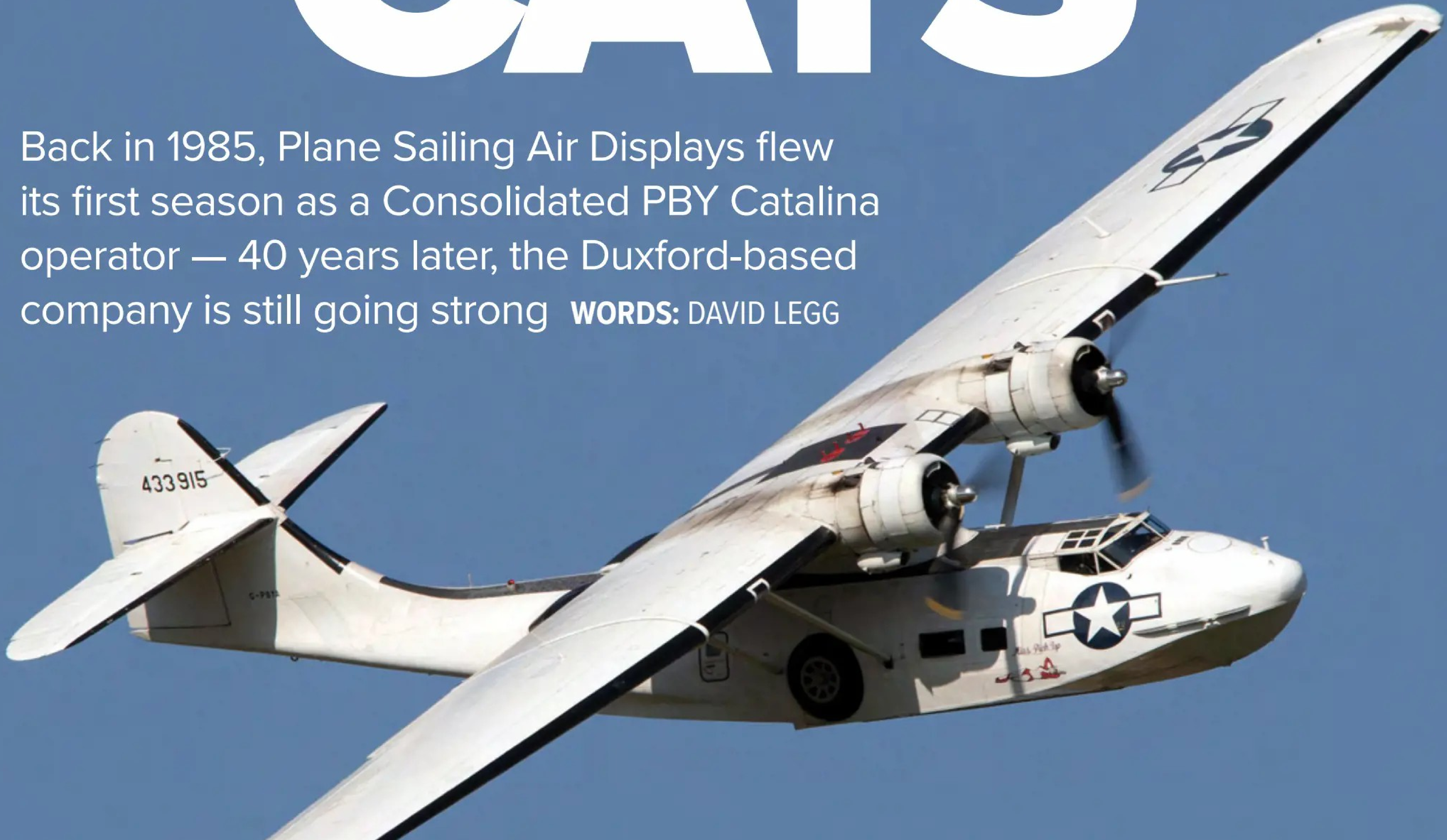


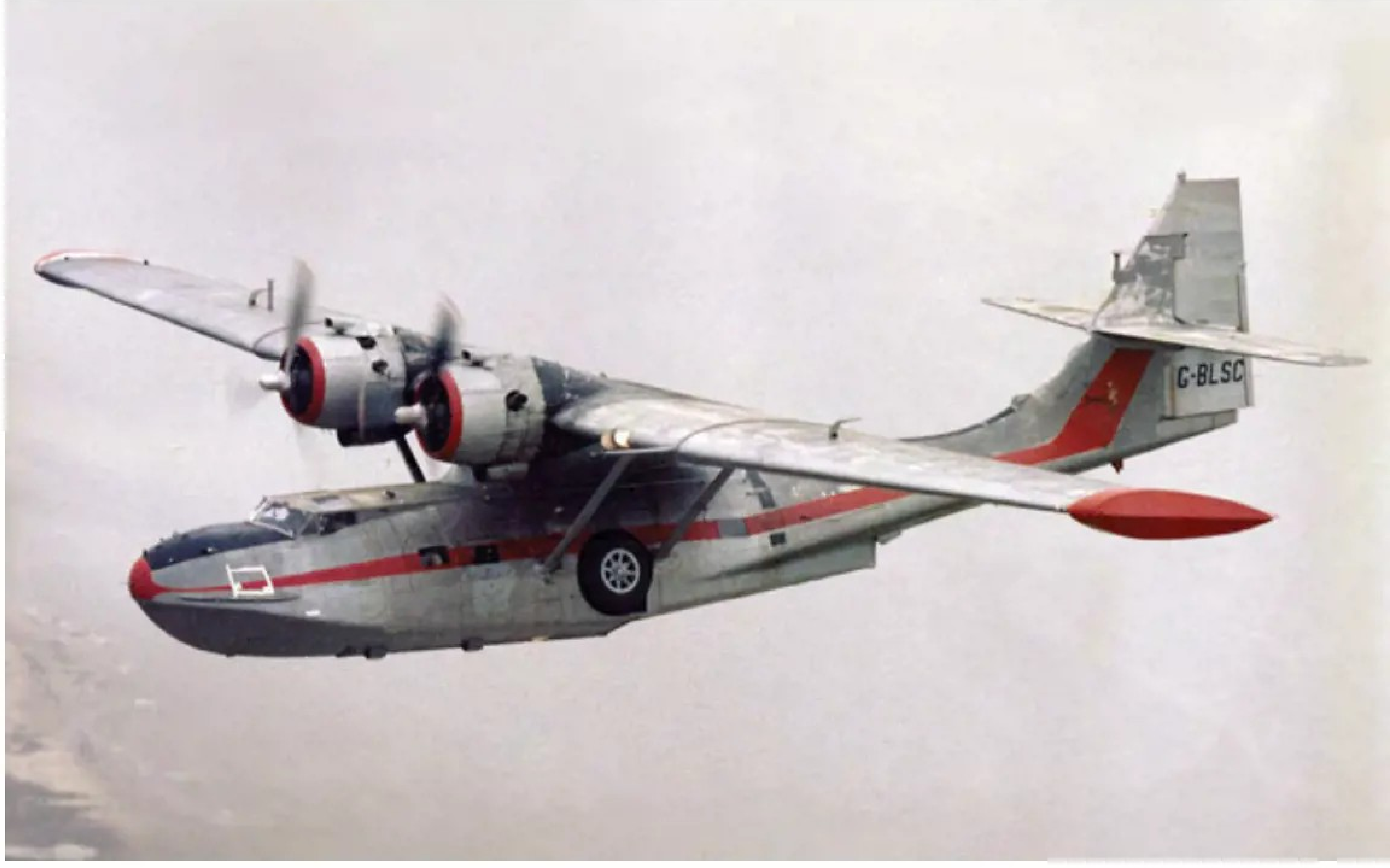
For its early displays in 1985, PBY-5A G-BLSC wore the name *Charles Gardner* in honour of the BBC correspondent who joined the RAF and flew Catalinas with Coastal Command. KEY/DUNCAN CUBITT

COOL FOR CATS

Back in 1985, Plane Sailing Air Displays flew its first season as a Consolidated PBY Catalina operator — 40 years later, the Duxford-based company is still going strong **WORDS:** DAVID LEGG



Today's Plane Sailing Catalina, G-PBYA, being displayed at Melun-Villaroche in 2023 by a crew headed by Angelo Cunningham. BEN DUNNELL



ABOVE: **The late John Watts with a trophy won at 1987's Texel Airshow in the Netherlands for furthest-travelled participant, not that it had journeyed very far.** RUSSELL MASON

TOP RIGHT: **Still in the colours it had sported in use with survey company Geoterrex, G-BLSC arrives over the UK coast in February 1985.** VIA DAVID LEGG

ABOVE RIGHT: **An engine run for the freshly painted aircraft at Barkston Heath, its first UK base.** RUSSELL MASON

I can still recall where I was when I first read in the aviation press about plans to bring a Catalina flying boat to the UK to operate on the European airshow scene. Sitting in a tearoom in Tunbridge Wells, Kent just before Christmas 1984, I learned a small group had acquired an amphibious Catalina from a Canadian company in South Africa where the aircraft had been engaged in aerial geophysical survey work. Comprising Royal Air Force fast jet pilots John Watts and Paul Warren Wilson, together with the well-known aviation photographer and film-maker Arthur Gibson, they were looking to establish a support team. It would initially restore the PBY to display standard and then support it as it toured the circuit.

I already had an interest in Catalinas, having seen a number in British Columbia, Canada in the late 1970s, and I was looking at ways to get on 'the other side of the fence' at airshows. This seemed like a great opportunity, and I wrote to the Reigate address of the intriguingly named Plane Sailing Air Displays to offer my services as an enthusiastic, albeit technically unqualified, volunteer. Back came the reply with the letterhead, "Consolidated PBY-5A Catalina flying boat operations — from land, river, lake and sea". I was in — and in 2025 I am still there after 40 years of continuous involvement. But let's go back to the beginning.

◆

John and Paul had passed through the RAF College Cranwell together and had graduated to fast jets, John on Tornado GR1s and Paul on Harriers. Both had begun to get involved in civilian air display flying, on warbirds in particular. By the early 1980s they were looking to obtain an aircraft that was unique to the airshow scene and would be fun to fly, as well as having a significance to surviving RAF aircrew from World War Two. The flexibility a flying boat offered was appealing and they discovered an airworthy Catalina for sale in South Africa.

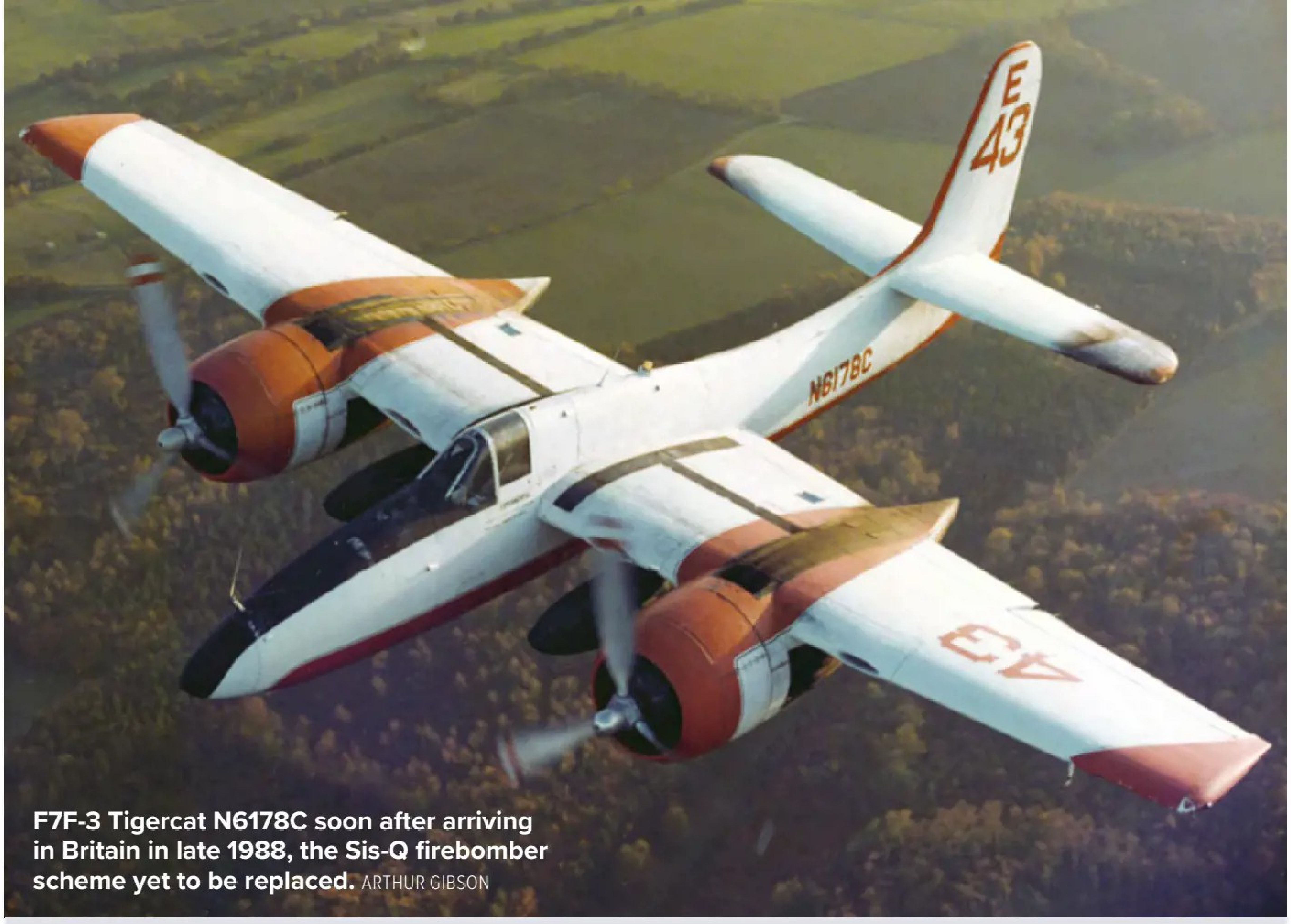
This aircraft had been built as a PBY-5A for the US Navy by Consolidated Vultee at its New Orleans factory at the very end of 1944. Given BuNo 46633, it remained operational until mid-1953 when it went into storage at Litchfield Park, Arizona. It was finally stricken from charge in August 1956 and purchased by a New Jersey-based broker. The following year it was sold on to a Canadian cement company and subsequently converted to an executive aircraft. This involved re-engining with Wright R-2600 Cyclones of 1,700hp each, the removal of the bow and rear hull turrets, the installation of a larger rudder and an airstair under the tail, as well as the ability to carry a dinghy under each wing. Modelled on the existing Super Catalina conversions which had been carried out on a number of airframes, the unique Noorduyn version was known as the S/C 1000 Super Canso. Registered

CF-MIR, the machine later passed through the hands of a number of Canadian and US companies including Geoterrex with whom it travelled the world on survey contracts, latterly in India and South Africa before being retired at Rand Airport near Johannesburg in 1984. That December John, Paul and 'Dizzy' Addicott travelled out to Rand to inspect the Catalina and oversee its preparation for the long delivery flight to the UK.

The ferry crew arrived in South Africa during mid-February 1985 to fly the Catalina, now on the British register as G-BLSC, to England. With 'Dizzy' no longer available, the crew consisted of pilots John Watts and B-17 *Sally B* captain Keith Sissons together with Pete Rushen, who had recently been chief engineer of the RAF's Battle of Britain Memorial Flight. The Catalina had been moved to what was then Jan Smuts Airport, Johannesburg and the delivery flight commenced on 14 February. The route took the crew via Lusaka, Nairobi, Khartoum (where Martin Thompson of Tradewinds Airways joined), Alexandria, Palermo, Cagliari (where Paul joined) and Marseille before setting off on the 20th for RAF Manston in Kent. There, in rather gloomy and cold conditions, the Catalina was escorted in by its more modern maritime reconnaissance equivalent, a Nimrod from RAF St Mawgan. A small reception committee was on hand, including the author.

A few days later, the Catalina was flown to its new home at RAF Barkston Heath in Lincolnshire, then a Bloodhound missile base and used for practice landings by aircraft from nearby Cranwell. There Plane Sailing's team settled into a large, almost empty hangar and began an overhaul and 'deep clean' inside and out that would see the aeroplane ready for the forthcoming airshow season. A mixed bunch of service personnel and civilian volunteers under the supervision of Pete Rushen started to attend Barkston each weekend, some like me covering several hundred miles and staying overnight, either 'sofa-surfing' or, on some occasions, sleeping in my car in the hangar. It took remarkably little time to prepare, after which a repaint was conducted to represent the RAF Catalina, JV928/Y, that had been flown by Fg Off John Cruickshank of No 210 Squadron, Coastal Command when he earned the Victoria Cross in July 1944.

G-BLSC was rolled out at the beginning of May 1985 and flew its debut airshow at Rotterdam on the 5th, creating a stir among the crowds as it gracefully performed the first of countless displays to come. Its UK bow was taken the following weekend at the Biggin Hill Air Fair. In those days, it was not uncommon for a small number of crew members to accompany the pilots during a

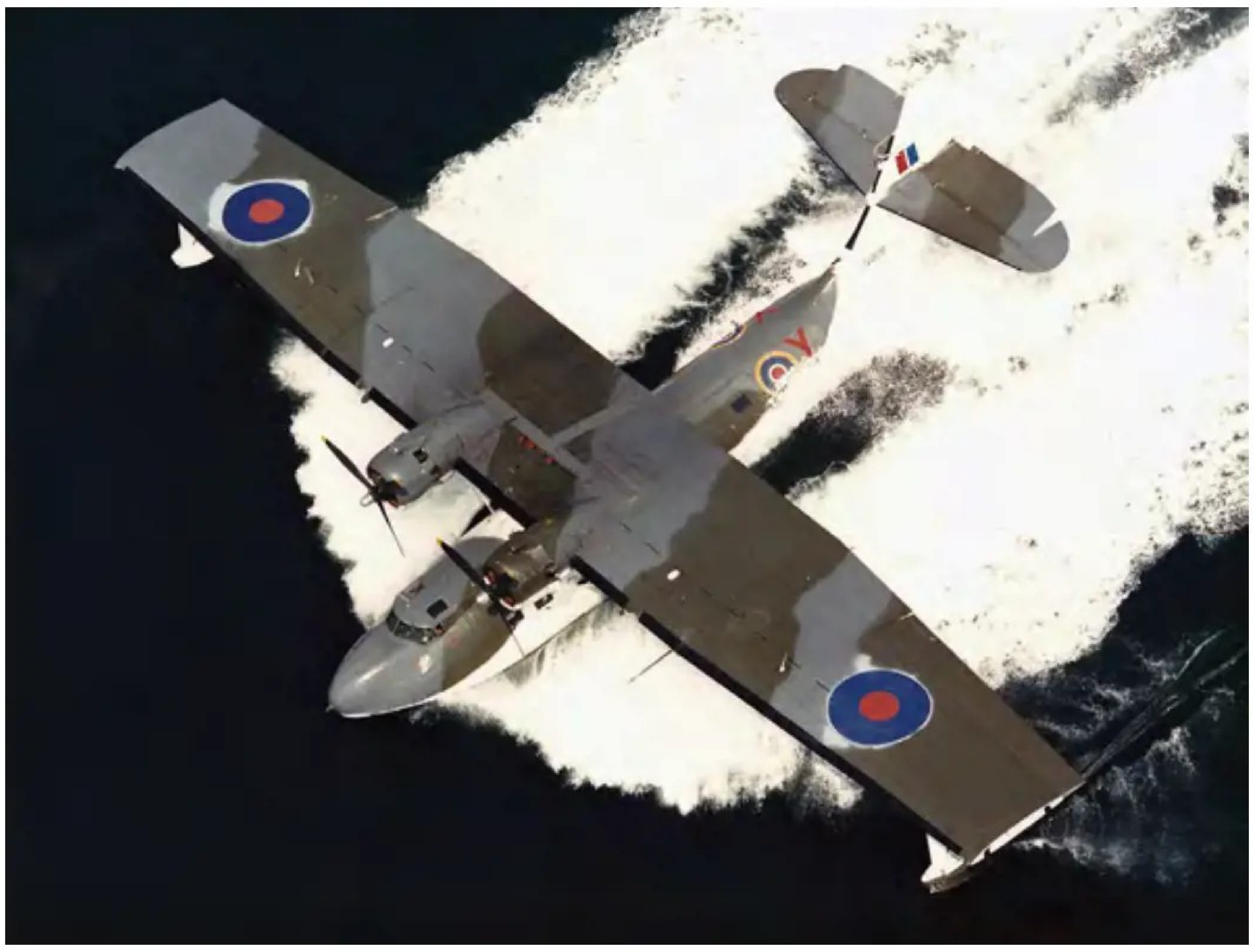


F7F-3 Tigercat N6178C soon after arriving in Britain in late 1988, the Sis-Q firebomber scheme yet to be replaced. ARTHUR GIBSON

SPREADING THEIR WINGS

For a brief period in the late 1980s and early 1990s, the overall team was involved with two other aircraft. One was a Pilatus P2, G-BJAX, which John Watts and Mark Hanna had imported from Switzerland during the early 1980s. Painted in pseudo-Luftwaffe markings, it often doubled as a German fighter in mock battles, but was also an excellent machine to let off steam in! At the 1988 North Weald Fighter Meet, John and Paul using a second, borrowed, P2 even flew a two-ship synchro pair display. Riding with John during rehearsals was unforgettable as they 'wired' the airfield at low level.

John had dreamed of acquiring a Grumman F7F-3 Tigercat but his untimely death meant, for him, the idea would be unfulfilled. Nevertheless, Paul went ahead and purchased former Sis-Q borate bomber BuNo 80483/N6178C, flying it solo from California to Duxford. After its arrival in November 1988 it was painted dark blue overall and bore the tail code 'JW' in John's memory. The P2 and Tigercat were registered to Lea Aviation rather than Plane Sailing but were maintained by the same team. In due course, though, the decision was made to concentrate on the core Catalina operation and both were disposed of.



LEFT: Early water operations proved the aircraft's continued suitability for such activities. VIA DAVID LEGG

ABOVE: The 1994 Peter Stuyvesant Travel Odyssey, and the Catalina in its element off the Bahamian island of Bimini. ALAMY

display and, much to my surprise, I was invited to fly there. Despite the dreary weather it was an exciting first Catalina flight for me — many hundreds have followed.

1985 was highly successful, introducing many airshow visitors to an airworthy PBY who'd never seen one before. It also saw water operations, with G-BLSC alighting on Lough Neagh during a trip to Northern Ireland. One of the aims in having the Catalina was to make it available for film work, and an early opportunity cropped up in August when it was hired to take part in the TVS drama *92 Grosvenor Street*, also known as *Behind Enemy Lines*, starring David McCallum. Transiting to Norway and using a fjord near Trondheim again proved G-BLSC was fully seaworthy, and it was henceforth to operate from water on regular occasions.

Before Edward Hulton's Sunderland V, G-BJHS, appeared over West Malling during the 1989 Great Warbirds Air Display, the opportunity was taken for the Catalina to join up with it for some unique air-to-air images. ARTHUR GIBSON

After the inaugural year, it was a blow when the 1986 season had to be missed. A structural audit over the 1985-86 winter revealed a crack in the spar web close to the point where the port forward wing strut meets the wing. This meant new parts had to be manufactured with inevitable delays. However, 1986 did see the formation of The Catalina Society. Following a meeting in a pub near London's Fleet Street involving Russell Mason, John Watts, Arthur Gibson, Martin Thompson and me, it was agreed this supporter organisation would be established to bring together individuals with an interest in the PBY and veterans who had seen service on the type. At the same time, surplus funds raised through subscriptions and sales of merchandise at airshows would be used to aid the aircraft's operation. Members would receive regular newsletters. Today, the society still thrives and, after 102 editions of *The Catalina News*, carries out its original aims although, alas, there are now very few veterans left.

◆

With repairs carried out, G-BLSC took to the air again in March 1987 and thereafter flew many successful seasons, establishing an enviable

reliability record as displays were carried out all over Europe. More film work came with alighting on the Thames Estuary for preliminary takes for the film *White Mischief*, while Boots the Chemists used the Catalina as a static advertising backdrop for a range of men's toiletries! Memorably, the fixing company Rawlplug engaged the 'Cat' for a promotional exercise in February 1989 that involved touching down on the River Thames, water-taxiing through the Thames Barrier and beneath Tower Bridge, and mooring up before returning later the same day.

Tragedy struck the organisation when, on the night of 9 August 1988, John Watts was killed in a head-on collision over Appleby in Cumbria between the Tornado GR1 he was flying out of Cottesmore and one of a pair of GR1s operating from Marham. All four airmen on board the jets died. This robbed Plane Sailing of a driving force, the team of a dear friend and the airshow world of a superb pilot, renowned for displays not only in the Catalina but also the Pilatus P2 and Lindsey Walton's F4U-7 Corsair, as well as Spitfire flying in the TV mini-series *Piece of Cake*. Despite the loss of his close friend and associate, Paul Warren Wilson resolved to continue the Catalina operation.

By this time, Plane Sailing had moved from Barkston Heath to the Imperial War Museum airfield at Duxford. Although it had been excellent to begin at Barkston, flying from there presented practical difficulties because of the lack of fire cover and other infrastructure. Duxford had become established as the premier warbird airfield in the UK and it was a logical place to relocate to. It remains Plane Sailing's base to this day and we enjoy a great working relationship with the IWM.

> *"The blisters transformed the aeroplane, both outside and in"*

A characteristic of most Catalinas when built was the 'blister' gun turret on each side of the rear hull. G-BLSC had these originally but they had been removed after the aircraft was sold by the US Navy. Plane Sailing managed to source a set that had been taken from a waterbombing PBY-6A in Ontario, which were air-freighted to the UK and, in due course, installed on our 'Cat'. The engineering work was carried out by Dan-Air as an apprentice exercise by a team under the supervision of Stuart Powney over the winter of 1989-90, and the result transformed the aeroplane, both from the outside and from the crew's perspective within.

Overall engineering responsibility for the Catalina had passed through a few people since Pete Rushen's in the early days but, in November 1990, Garry Short took on the role of chief engineer. He has been in post ever since, although plans are in place for his retirement in due course when Chris Hodson, currently under training, will take over. Garry brought with him engineering experience in the RAF and the commercial sector, and has used it on numerous challenges presented by our World War Two flying boat.

Founding member Arthur Gibson passed away in 1992. He had been a tremendous help at the start with both funding and practical advice and, through his media connections, was adept at securing sponsorship for the annual Fighter Meet

ABOVE: Paul Warren Wilson at the helm near Natal as VR-BPS conducts its longest trip to date. ALAMY

TOP LEFT: The RCAF Canso livery as 9754 was applied because the overall white finish would be a good one to overlay with sponsors' colours. VIA DAVID LEGG

ABOVE LEFT: Back in business with a new 'Cat', as C-FNJF goes through its paces at the 2004 Sywell Airshow. KEY/NIGEL PRICE

ABOVE: VC recipient John Cruickshank has regularly been reunited with the Catalina thanks to Plane Sailing, as here at Leuchars during 2013. CROWN COPYRIGHT

TOP RIGHT: The crew for 2024's Operation 'Shetland': from left to right, David Legg, shareholder pilots David Barlow, Jeff Boyling and John Harmsworth, and shareholder Humphrey Truswell. VIA JEFF BOYLING

ABOVE RIGHT: Few of *Miss Pick Up*'s lengthy overseas tours have presented quite the challenges of Operation 'World First', flying in Greenland's wilds. VIA DAVID LEGG

airshow at North Weald which had close links with Plane Sailing and the Catalina. A larger-than-life character, he was much missed.

Prior to the 1993 season, G-BLSC was repainted overall white. This was in anticipation of taking part in that year's Peter Stuyvesant Travel Odyssey, in which contest-winning students would go on a journey to South America. The white colours could be overlaid with a bespoke but removable Peter Stuyvesant livery, an eye-catching scheme which was applied at Duxford. In the event, a last-minute change of mind at the Civil Aviation Authority meant the use of 16 passenger seats was vetoed and the Catalina was unable to make the trip, another example — the Zimbabwe-registered Z-CAT — filling in at short notice. G-BLSC flew for 1993 in the basic white scheme of Royal Canadian Air Force Canso A serial 9754/P, in which Flt Lt David Hornell of No 162 (Bomber Reconnaissance) Squadron earned his posthumous Victoria Cross during 1944.

Hans Wiesman, a Dutch Catalina enthusiast and the man behind the Travel Odyssey, planned to repeat the endeavour in 1994 and was determined Plane Sailing would get the contract. This involved G-BLSC being removed from the British register that February and being re-registered in Bermuda as VR-BPS, with ownership being transferred to PS (Bermuda) and a variation on the 1993 scheme applied. Thus was enabled the carriage of a full complement of passengers as well as two pilots and engineer Garry Short.

◆

Departing the UK on 17 September, the Catalina arrived in Natal, Brazil via Porto, Lanzarote and Sal and Praia, both in the Cape Verde Islands, after five days and 32 hours of flying. The passengers, film crew, journalists and Hans boarded at Natal and the voyage started on the 24th, with a flight 350 miles out into the Atlantic and the island of Fernando de Noronha, a US Navy PBY-5A base in the Second World War. From there, the itinerary took in various locations with a water alighting in the exotic surroundings of the Baía de Todos-os-Santos in Salvador before heading down to Rio and more water ops, during which the port powerplant failed on take-off. Through much hard work and improvisation, Garry Short accomplished an engine change.

The tour continued at La Paz, Bolivia with a climb over the Andes, the more powerful Wright Cyclones really coming into their own. After a brief but exhilarating trip onto Lake Titicaca, the highest lake in the world, the Catalina flew on to Lima in Peru and Quito, Ecuador. The route took the 'Cat' to Cayo Coco, Cuba and Bimini in the Bahamas, prior to the last port of call at Watson Island, Miami. The uneventful return to Duxford was via St John's, Newfoundland and Shannon. With the exception of the engine problem in Rio, it had been a real success and an example of the huge challenges Plane Sailing could take on.

Plane Sailing has never pursued major sponsorship but, in addition to the Peter Stuyvesant trip, it has from time to time carried out one-off contracts for companies. One such was in the summer of 1995 when VR-BPS went out to Italy to undertake some promotional work for Peroni Nastro Azzurro. The plain white airframe again overlaid with corporate colours, the Catalina flew around the coasts of Italy, alighting on the sea just off sandy beaches whereupon company hostesses would distribute free beer to holidaymakers from the rear hull blisters. So successful was the exercise that it was repeated during July and August the following year with another bold livery featuring prominent Nastro Azzurro and Aprilia logos. Continuing the alcoholic theme, the aircraft flew with S. Orsola Asti sparkling wine logos for another brief sponsorship deal in 1996.

Alongside these unusual trips the Catalina — re-registered VP-BPS in 1997 following changes to the Bermudan civil register — continued its bread-and-butter airshow work, but another tragic occurrence intervened. On 27 July 1998, the aeroplane was damaged beyond repair during a 'splash-and-go' on Southampton Water while engaged in promotional work for the Sea Wings 2000 airshow. A nosewheel door torque tube failure due to undetected internal corrosion caused the doors to break away and water to enter the bow area, leading to the Catalina sinking. Sadly, two passengers drowned in the accident despite being seated adjacent to an opened emergency exit.

In being lifted quickly the water-filled hull was further damaged, adding to the effects of salt water on the engines and interior equipment. The decision was taken not to repair VP-BPS and, after 13 successful seasons, it was the end of the line for this wonderful aircraft that had given its crew, supporters and the public so much pleasure.

Following the loss of John Watts and Arthur Gibson, Paul Warren Wilson had borne the brunt of running the whole Catalina operation. It would have been quite understandable if, at this point, he had decided to stop and do something else with his life. However, he took the decision to carry on and find a replacement aircraft while completely restructuring the organisation. Prior to the loss of the first Catalina, some thought had been given to selling shares in it — indeed, advertisements had appeared in the aviation press although the idea had not progressed. Now the search was on for a second PBY and sufficient shareholders to finance the acquisition and fly it to the UK.

A suitable candidate was found at Nanaimo on British Columbia's Vancouver Island. This was a former Royal Canadian Air Force Canso A, equivalent to the US Navy's PBY-5A. Built by Canadian Vickers in 1944, it had seen wartime service on Canada's west coast and then flew as a transport, supporting survey and mapping work in Canada's far north and air-sea-rescue in the west. It was struck off strength in 1960 and went on to a long career as a water-bombing firefighter in Canada, France and Chile, finally being withdrawn from use in the mid-1990s. Plans by a Malaysian consortium to fly it on passenger charters based in Zimbabwe, together with a second example, faltered when the political situation there took a turn for the worse and the two partially converted aircraft ended up in open storage at Nanaimo. One of the pair, C-FNJF — ex-RCAF 11005 — represented a good prospect as Plane Sailing's replacement and its purchase was completed in 2002.

> *"The search was on for a second PBY and sufficient shareholders"*

Sufficient potential shareholders had come forward to buy the aeroplane, complete the conversion work and the necessary paperwork, and fly it to Duxford. It all took somewhat longer than anticipated, but in due course C-FNJF was flown to its new home on a carefully planned route that avoided the Rockies but took in various locations where engineers familiar with old radial-engined aircraft could help if necessary. It set off from Nanaimo on 1 March 2004 and arrived at Duxford on the 30th, having routed via airfields in Washington, California, Arizona, Texas, Alabama, North Carolina, New Jersey, Maine, Newfoundland and Ireland.

From now on, the organisation's structure would be different. Plane Sailing Air Displays would continue to operate and maintain the aircraft, providing technical and administrative support and marketing the Catalina to airshow organisers and other parties interested in using it, such as film and TV companies. Actual ownership would be vested in the shareholders, collectively known as Catalina Aircraft Ltd. The Catalina Society would provide support as a 'fan club'.

ABOVE: With Paul Warren Wilson sitting astride the cockpit, students from Worksop College prepare to embark from the lake at Faxa Sø in eastern Greenland.
VIA DAVID LEGG

ABOVE: ***Miss Pick Up*** **often deploys to Biscarrosse, France's great historic centre of water-borne aviation, for training purposes.** P-E LANGENFELD

More information on the history of Plane Sailing's Catalina, the original *Miss Pick Up*, shareholder opportunities and The Catalina Society may be found at www.catalina.org.uk

This arrangement meant responsibility for operations would no longer rest on one person's shoulders but could be split amongst the shareholders. The latter have changed from time to time as some move on and others join, so there is a mix of pilots and non-pilots from different backgrounds. Being multi-crew, the 'Cat' enables new or inexperienced pilots to train on the aircraft, Plane Sailing becoming a type rating training organisation in 2011. It has proved to be an effective and durable structure over the past 20 years.

The core business of display flying continued very soon after C-FNJF's arrival and it has been active in every season since then. Placed on the UK register as G-PBYA in 2005, it was also repainted that year, the former yellow, green and red waterbombing livery being replaced with colours suggested by this writer. Since then it has represented OA-10A 44-33915 *Miss Pick Up*, a Halesworth-based US Army Air Forces rescue aircraft lost to gunfire from a Luftwaffe Me 262 jet while on the North Sea at the end of March 1944.

Since 2004, G-PBYA has travelled far and wide to attend airshows all over the Continent: to Iceland and most of the Scandinavian countries including arctic Norway, to Moscow, central Turkey, Poland and the Czech Republic, as well as many venues in the UK and Ireland. It has also flown some interesting trips arranged by shareholders who can use the aircraft at their own expense, filling the 14 seats available with their guests if they wish. Among them have been a round-Britain flight in 2013, 100 years after Harry Hawker's unsuccessful attempt, a re-enactment of the 1931 Schneider Trophy contest over the Solent in 2021 and, during 2024, Operation 'Shetland' which commemorated the two Catalina VCs awarded 80 years before to Flt Lt David Hornell and Fg Off John Cruickshank and included orbits over 104-year-old John's home in Aberdeen. John had previously flown in *Miss Pick Up* on a sortie from RAF Leuchars back in September 2013. All three of these events were organised by shareholder/pilot Jeff Boyling.

> ***"We travel far and wide to attend airshows"***

An unusual mission in July 2015 was Operation 'World First' on which a party of students and teachers from Worksop College, Nottinghamshire were flown from Loch Lomond via Iceland to eastern Greenland for a three-week outward-bound exercise. Several years of planning resulted in a most successful expedition in which the Catalina, bedecked in a special Worksop College livery, behaved faultlessly.

A break in COVID restrictions during October 2020 saw two separate filming opportunities coming *Miss Pick Up*'s way. The first was on location at RAF Halton for an episode of the Batman spin-off *Pennyworth* and was mainly ground-based. The second was on and around Loch Ness for Freddie Flintoff and Jamie Redknapp's series *A League of Their Own*. As was widely reported at the time, the Catalina's starboard engine failed on the water right at the end of shooting, resulting in a rescue by the RNLI and an outdoor engine change on a small pier beside the loch. The recovery to Duxford after six weeks demonstrated the engineering skills and teamwork that are a feature of the Plane Sailing Air Displays and Catalina Aircraft group. All of that has built on the experiences of the past four decades.

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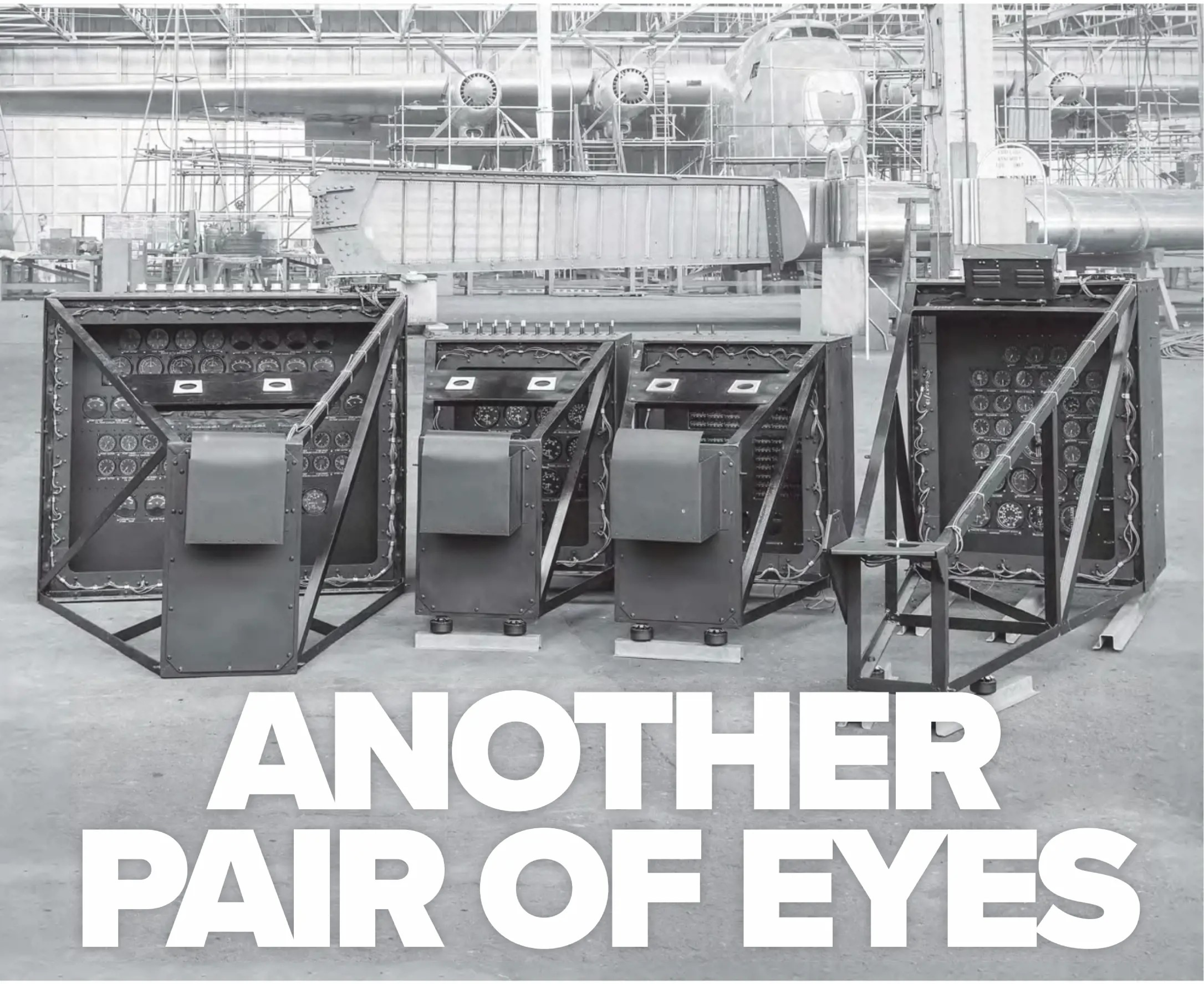

ANOTHER PAIR OF EYES

Even for an experienced test pilot, writing down data in the cockpit while in flight was becoming a more difficult business during World War Two, as aircraft performance reached new heights. This was where devices like Blackburn's Automatic Observer started to come in **WORDS:** STEVE BLEE

ABOVE: Automatic Observer units prior to installation into a Blackburn Universal Freighter.
ALL BAE SYSTEMS

When he was publicity manager for Blackburn and General Aircraft, then Hawker Siddeley Aviation at Brough, Mike Byrne's historical knowledge was well-known, but less so was his earlier technical experience. He joined Blackburn Aircraft in September 1937 as an apprentice, and on completion of the apprenticeship became a stress man. During the autumn of 1942 he was asked by the chief engineer, George Petty, to set up a flight test instrumentation section. Petty wanted better recording of the increased amount of data that was becoming available — and was required by the Air Ministry — on the new aircraft of the time. It would also help alleviate the difficulties test pilots had in doing so.

Byrne subsequently explained to *Flight* magazine in 1949 that for an aircraft such as the Gloster Gladiator, climbing at combat rating, recording figures at 1,000ft intervals gave the pilot around 30 seconds to write down each set. Wartime aircraft saw that figure at least halved by 1941, with the recognition that as development continued, an already hard task would become virtually impossible for the planned single-seat aircraft which were under development.

The first iteration of the Automatic Observer, as it was called, was produced for the Blackburn Firebrand I prototype in February 1942. Having recruited an ex-RAF photographer, along with a company fitter, Byrne's team designed the initial unit which used a Leica 35mm camera mounted on a crate. It photographed a bank of 15 instruments, operated by the pilot using a lever which served to both fire the camera and advance the film.

Situated within the fuselage, it was obviously necessary to provide illumination, this in the form of two electric lamps. To ensure a clear image of the gauges could be taken, dual polarising filters were fitted which removed the resultant glare from the gauge glass, bezel and mounting screws, giving a clear, useful image. It was, however, noted that incorrectly fitted or otherwise stressed glass on instruments such as the boost gauge would have their internal stresses highlighted by the polarising effect.

The development of the auto-observer was an obvious reaction to the need for more data to be gathered in an environment whereby rising aircraft performance was making manual data-gathering increasingly challenging. It was forever a compromise, though, between the photographic ideal and the limitations and restrictions of the aircraft. Large, multi-crew types would always have extra space to use, while single-seaters presented the greatest challenge. Since the fitment was for testing only, rather than creating what would become redundant additional structure, the observer crate was self-contained and mounted on rubber shock-proof mounts to eliminate vibration effects as far as possible.

With an initial limitation of 36 exposures, not surprisingly it very soon became clear that cine cameras — or, at least, motorised cameras using large reels of 35mm film stock — were required to cover the necessary testing. These were integrated to give more detailed coverage during high-speed manoeuvres. As such, 25 seconds of film taken during, for example, roll rate tests would provide enough data to generate 35 man-hours of analysis. The rubber shock absorber, along with the unit's rigidity to minimise any relative movement between the camera and the gauges, was sufficient to remove any blur in the final photographs/film. As fitted, the unit weighed 42lb. Along with an 8.5lb camera and the other sensors/connectors around the aircraft, it gave a total weight of 113lb. Some of the instruments used appeared exactly as those fitted in the cockpit, but were in fact specially calibrated versions. Other gauges providing position-indicating information used a 'Desynn' transmitter, while electrically driven gyros were utilised for pitch and roll.

> ***"Its development was a reaction to the need for more data"***

No information is available regarding the reliability of the systems, but Byrne did note, "One sidelight for students of psychology and languages is to witness the facial expressions and hear the enlightened talk of a pilot who has performed a protracted series of intricate tests, only to discover the camera has failed to operate". This suggests there must have been the occasional failure.

A prime example of the use of the automatic observer is the demonstration and certification of the ability to meet the requirements for a carrier deck landing, as Byrne explained: "The necessity for a low landing speed, combined with light effective controls requires a detailed study and assessment of the movements and forces involved. For this assessment, the instruments involved were accelerometer, air temperature, artificial horizon, port-aileron angle, starboard-aileron angle, aileron-trimmer angle, aileron stick-force, rate of roll, elevator angle, elevator trimmer angle, elevator spring-tab angle, elevator stick force, angle of yaw, rudder angle, rudder-trimmer angle, rudder spring-tab angle, port rudder-pedal force, starboard rudder-pedal force, ASI [air speed indicator], boost rpm and altimeter. If recordings are plotted against a time-base a series of

BELOW: The Firebrand I prototype at Brough in April 1942. DD804 had made its first flight two months previously.

ROYAL NAVY
DD 804
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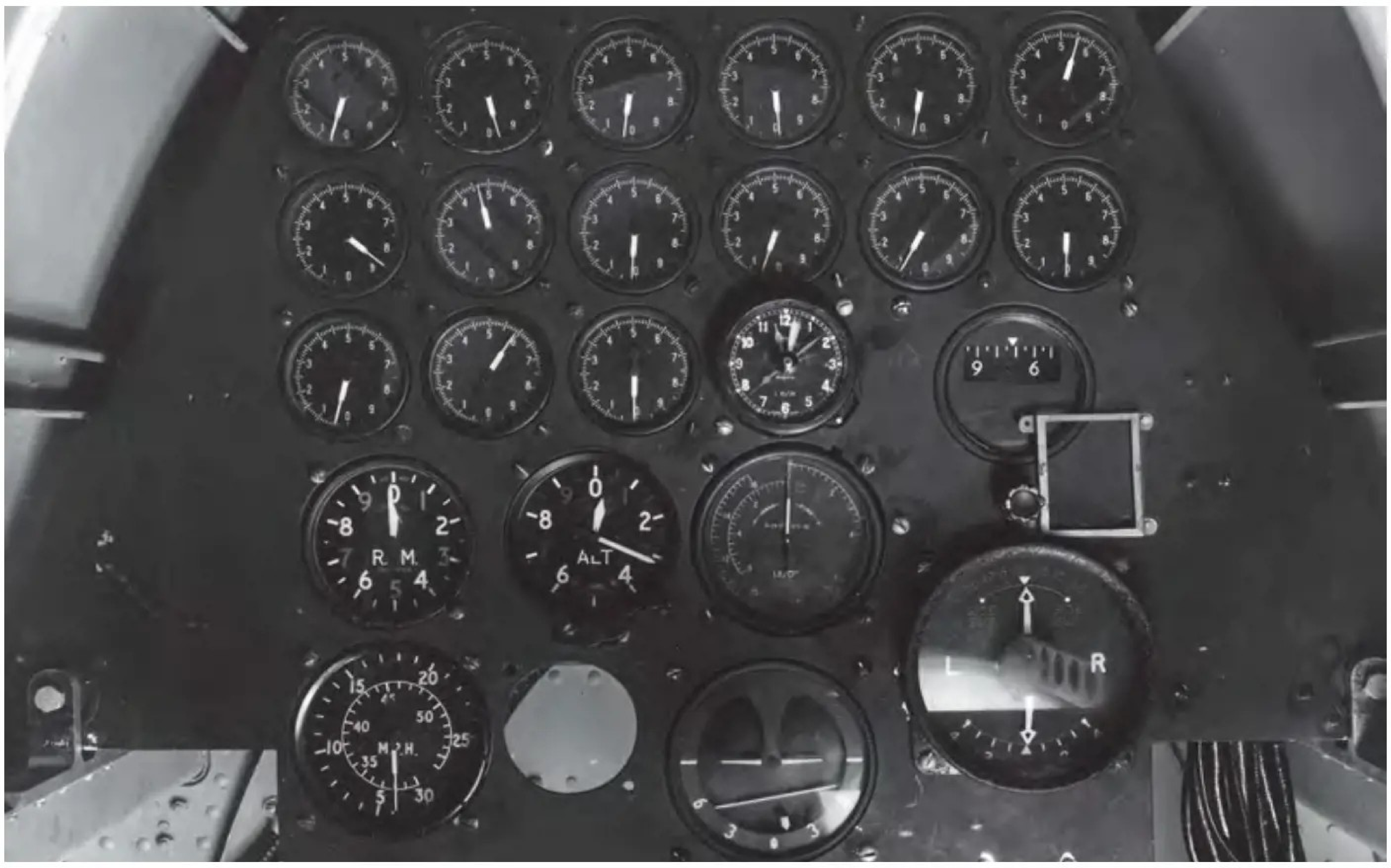

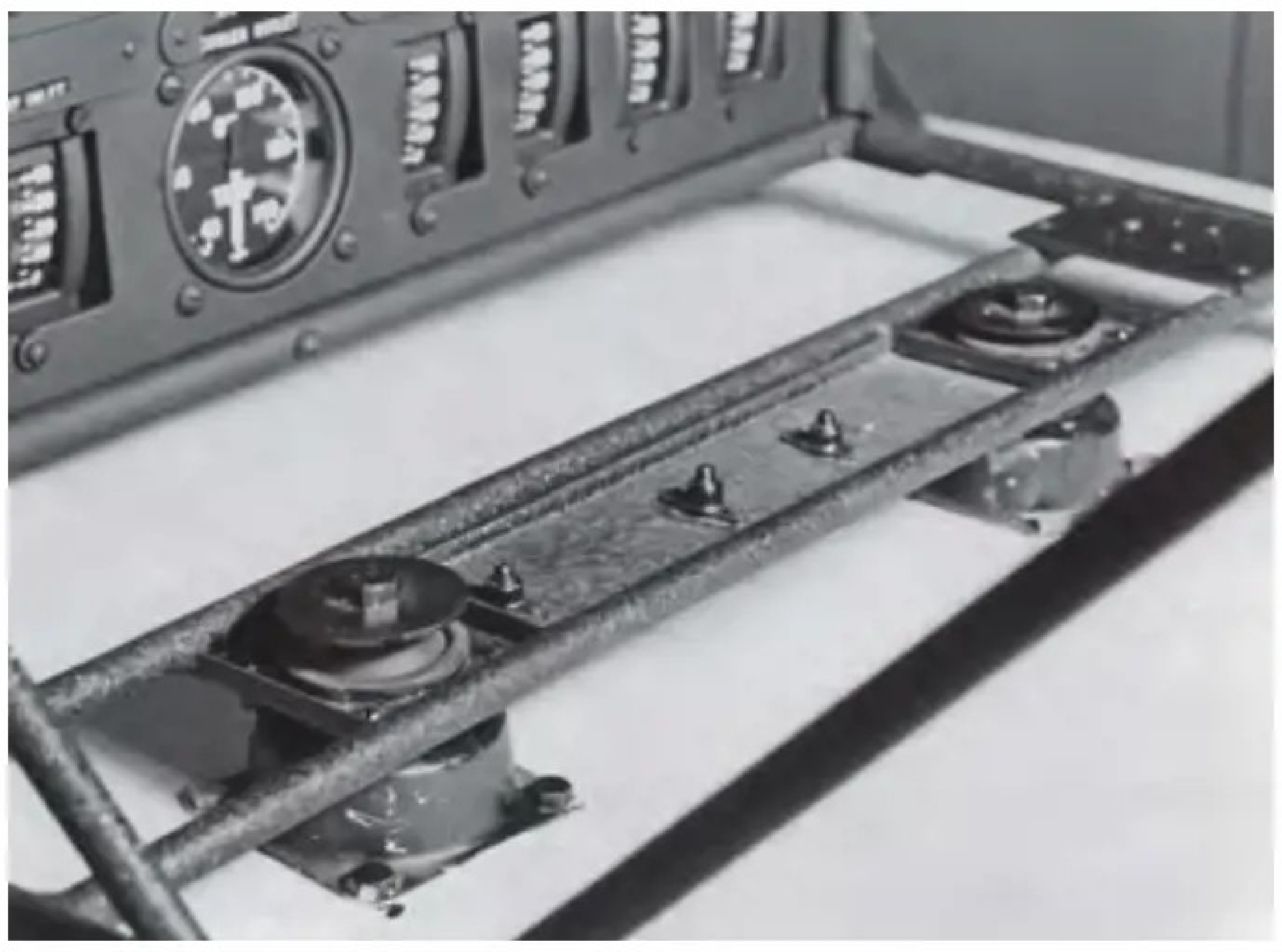

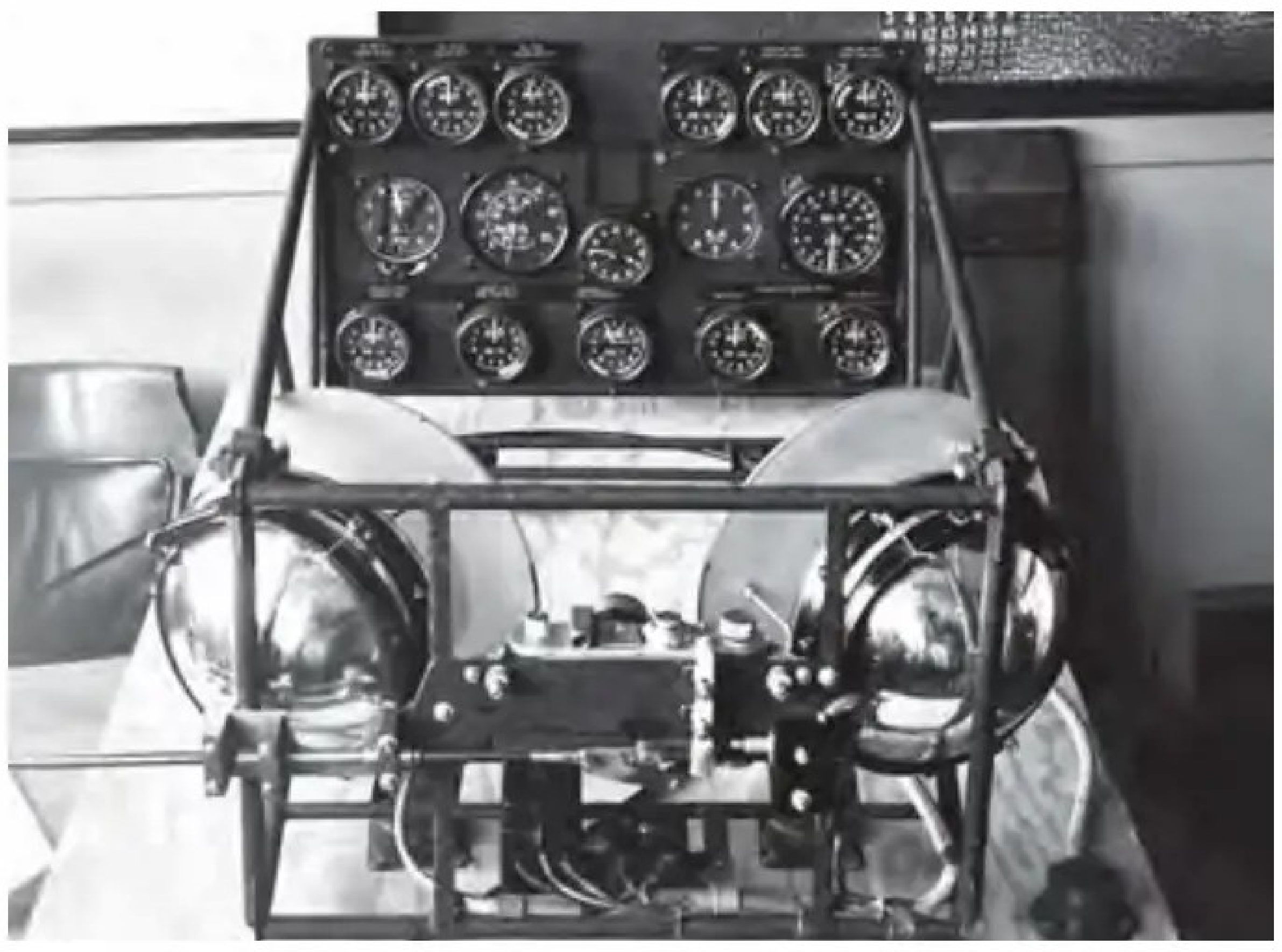

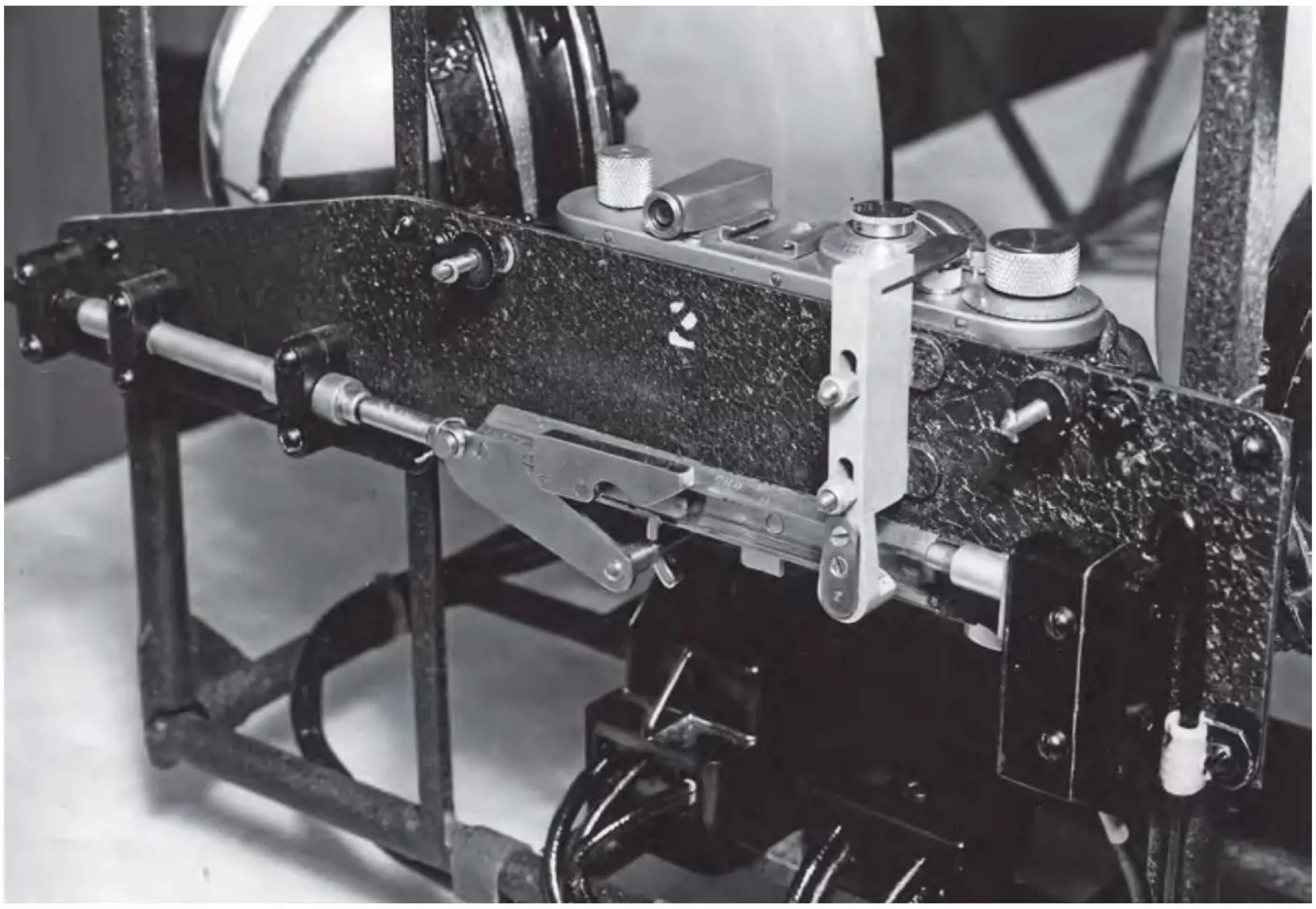

CLOCKWISE FROM TOP: This was the auto-observer panel in the form originally fitted to the Blackburn B48/YA1; the first iteration of the full auto-observer set prior to installation, with the pilot's operating lever situated at front left; the Leica camera mounting and operating mechanism of the auto-observer as integrated into the Firebrand prototype; and the shock absorber mounting for the Firebrand I's auto-observer, which improved image quality considerably.

curves can be drawn. For instance, in following the landing through, we obtain speed decreasing with time, the elevator angle and loads during the approach, and the final touch-down, which is indicated by micro-switches on the undercarriage legs. These micro-switches energise lights on the panel and prove whether all three wheels touch at once or not; this is necessary because the load and elevator angle must be correlated to the ability to get the tail down. In addition, there are the forces and angles for all the flying controls; these enable the load to be ascertained for holding-off on the landing approach, picking up a dropped wing, straightening up on to the true flight-path, or for performing other corrective manoeuvres. Any deviation from the ideal flight-path is indicated by the standard blind flying instruments so that, if a wing drops 10 degrees as shown by the artificial horizon, the time to get the aircraft level again is recorded, together with the aileron loads, angles and rate of roll involved in the ensuing action. The rpm and boost curves prove whether the pilot really carried out a power-off landing or whether a burst of throttle was required to achieve a three-point attitude.

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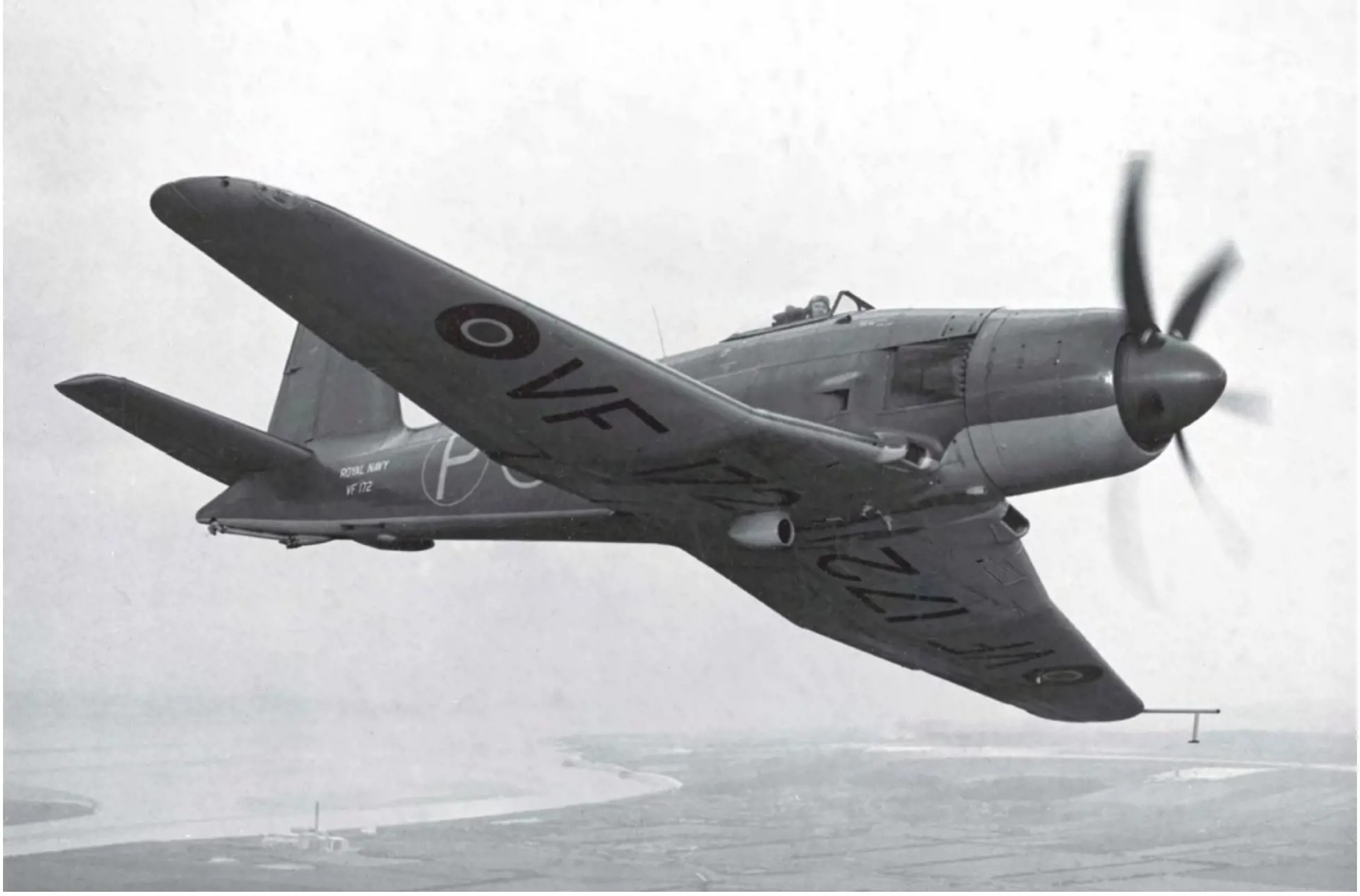
"The accelerometer records the standard of the touch-down — a recording up to +¾g may be considered to be a landing, but everything above that figure is regarded as an arrival."

It must not be forgotten that in using this form of auto-observer, the amount of data generated once the pilot was released from having to physically note everything on his knee pad greatly increased the work required. As Byrne notes, for the case of a rate of roll test, "The camera would be running at a high speed in order to cope with the rapid fluctuations of the needles of the instruments, which would be registering speed, height, engine conditions, stick force, aileron and tab angles, rate of roll and time interval. Thus at 24 frames per second 50ft of film would be used in 25 seconds, and with ten instruments on the panel there would be a total of 6,000 readings to log. The film has to be unloaded, developed, fixed, washed, dried and titled, all of which takes approximately 1 hour. With one person reading and one writing,



ABOVE: **The third Blackburn B48/YA1, VF172, in flight. This was the second flying prototype, the second airframe having been used for structural tests.**

the film results could be logged in 8 hours and the converted figures picked off the calibration curves in another 3 hours. The plotting of this information would take approximately 5 hours. and the interpretation a further 2 hours.

"In other words, 25 seconds of test flying with the camera running will produce over 35 man-hours, a ratio of 5,000:1. In practice, actual times are considerably reduced by giving the film less than the ideal period of processing and by accelerating drying. The employment of teams for logging, plotting, and so forth, will, with wise supervision, decrease to a marked degree the time lapse between the conclusion of the flight and the final interpretation of the results. On some occasions pin-point results of maxima or minima may provide sufficient evidence of the effect of a modification to enable the design staff to plan their next move, and an experienced technician can readily obtain spot readings by running the film through a projector."

The Firebrand development programme suffered a serious setback with the decision that supply of the Napier Sabre engine would be curtailed to prioritise the Typhoon. This led to a substantial redesign to allow installation of the Bristol Centaurus engine, various versions of which were subsequently used in the Firebrand III to Va. In October 1943, Petty's design staff began work under specification S28/43 for what was described as a Firebrand TF with a redesigned wing and improved pilot's view. Blackburn's designation was B48, and subsequently YA1 under the new Society of British Aircraft Constructors system. The aircraft featured an inverted gull wing with a thin laminar-flow section. The wing arrangement allowed a short undercarriage, with a double hydraulic wing fold reducing the aircraft's footprint for carrier operations. The prototype was rolled out at Brough and taken by road to RAF Leconfield, from where it made its first flight on 1 April 1947. Although never formally given a name, it was unofficially known as the Firecrest to Blackburn.

> *“The 1940s version of the auto-observer now seems very primitive”*

The B48 was eventually too late for a production contract, as piston engines were no longer considered suitable for future military combat aircraft. A redesigned B48 variant featuring a chin-mounted radiator with a turboprop-driven contra-rotating propeller was released but came to nothing. However, it did lead to the B54/YA5, a carrier-borne anti-submarine aircraft to specification GR17/45, which ultimately lost out to the Fairey Gannet.

Moving on a few years, what was now Blackburn and General Aircraft began flight-testing of its Universal Freighter, later to go into production for the RAF as the Beverley. Space was obviously not a critical issue on this aeroplane but the data-gathering during testing was made easier by the fitment of four units, which had the benefit of reducing the crew carried.

While there is no evidence or suggestion that Mike Byrne's team were the sole inventors of the automatic observer system, they were nonetheless early adopters and played a significant part. Engineers today have such a wide range of tools and systems available to them that the 1940s auto-observer now seems very primitive. Some of the last aircraft to take flight from Brough's runway before its closure were the BAE Systems Hawk T2s ordered for the RAF. Each of these aircraft is fitted with a comprehensive Health and Usage Monitoring System (HUMS), which is much more than just a simple black box. It is able to provide real-time monitoring, recording and replay through a multitude of parameters, using strain gauges, accelerometers and sensors to a degree that would amaze Mike and his team.

AEROPLANE *meets*

DAVE BARRELL

VIA DAVE BARRELL

Few pilots know the Stearman better than this one, thanks to years of memorable wingwalking displays around the world

WORDS: BEN DUNNELL

Speak to any of the fortunate few who spend their professional life flying airshows, and you realise it's not all glamour and public admiration. There is, inevitably, a great deal of graft behind the scenes involved in making it happen. The result, hopefully, is that the comparatively short period of the display itself is the calmest part of the whole process, putting all that diligent preparation into effect.

For the members of the AeroSuperBatics Wingwalkers, that goes whether the event's in China or the Cotswolds, such is the global extent of their activity. The uprated 450hp Boeing Stearman Kaydet biplanes with the 'girls on the wings' are among the best-loved performers on the circuit. And the role of leading them now falls to someone who, after team founder Vic Norman, ranks as one of the most experienced wingwalking display pilots there's ever been. Dave Barrell was quite a late starter in flying terms, having got his private pilot's licence at Cambridge in 1995 — the likes of his engineering studies at what was Anglia Polytechnic, now Anglia Ruskin University, and a busy career having got in the way. But he's more than made up for it since.

Having now amassed 1,400 public displays in 21 countries, and with thousands of Stearman hours, it's no surprise Dave has a fund of hugely entertaining stories to tell. To hear them, I went on a freezing winter's afternoon to AeroSuperBatics' delightful base at Rendcomb, the former Royal Flying Corps aerodrome in rural Gloucestershire, where the hangar is full of reminders of team identities past. There Dave is busy readying the aeroplanes for next season, engineering being just as much a part of his job as flying.

"When I left school", he says, "I was an apprentice welder to start with — nothing to do with aeroplanes. I progressed through that and ended up working for a French company which was doing a lot of nuclear stuff, including the Trident submarine project… Then, when I came back to the UK I did a bit of work for a company at Bourn airfield in the

The AeroSuperBatics Wingwalkers in action at Portrush last September, with Dave and Steve Noujaim aboard the two 450hp Stearman Kaydets. ALAMY

At the controls of Barrie Emerson's PT-17, N52485, at the Sywell show in 2004. KEY/NIGEL PRICE

N5057V
AeroSuperBatics
EXCELLENCE IN WINGWALKING
G-IIIY
AeroSuperBatics
EXCELLENCE IN WINGWALKING

27
U.S.NAVY 169
169

Dave's own Stearman was N2S-5 G-NZSS, painted in classic US Army Air Corps training colours, and nearest in this formation. KEY/NIGEL PRICE

RIGHT: Team Guinot was the new branding for Dave's first AeroSuperBatics season. BEN DUNNELL

RIGHT: With wingwalker Stella Guilding at 2008's Biggin Hill Air Fair, always a regular AeroSuperBatics fixture. AVPICS/ALAMY

old hangars. I read up and found out the Rural Flying Corps was there, and I had a lesson with them in a Cessna 150. That took a bit of a back seat while I bought a garage; I was a car mechanic and an MoT tester, and employed five guys. It was going really well, and as I was the boss I could take time off, so I went and learned to fly. I took a trial lesson in a Cessna 152 with Daz James, who's an ex-Harrier RAF guy — lovely bloke — and I loved it. I went, 'There's my money. Teach me to fly.'... I went solo in six hours."

Vintage aircraft were already in Dave's sights. He'd been to Duxford and had a ride in the back seat of a Harvard, Andrew Edie's G-BKRA, with Classic Wings. John Romain was a near-neighbour, and his parents had known the late John Larcombe well. "I really wanted to go down that route, but, obviously, I had no experience. I did a twin rating and an IMC rating, and Marshalls had a Piper Aztec, G-BATN, so I was flying that". He owned a share in a Piper Warrior, and built hours on the Cherokee Six jump platforms used by the Ipswich Parachute Centre, which had moved to Old Buckenham after Ipswich Airport closed in the mid-1990s.

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"At Old Buckenham I saw [actor] Martin Shaw's Stearman and thought, 'That looks nice.' Then I heard there was one at Swanton Morley, and you could pay the chap and get converted onto it. That was the infamous Jim Avis with G-NZSS. I went there, flew that and did the conversion with Dave Bagshaw. Jim was arrested, so that all went a bit pear-shaped, and I ended up with the aeroplane. I wondered what I could do with it. Swanton was kind of closing down, so I moved it to Monewden in Suffolk.

"While I was flying the parachute aircraft at Old Buckenham, I'd got friendly with Dave Puleston, who was working in the maintenance facility there for Touchdown Engineering, and Dale Featherby at Norwich, who was operating a Pitts S-2 and a Yak-52. The Bayliss two-seat Spitfire [MJ627] was going in there at the time, with Paul Day flying it, and I had a ride in that out of Norwich. In the late '90s myself and Dave got our initial DAs [display authorisations] on my Stearman at Monewden with Mike Wood, who at the time was flying RAF Grob Tutors out of Wyton. We did a few shows together at things like weddings and carnivals. Then in 2004 I did a show at Chailey, the former advanced landing ground near Gatwick, where Mike Wood was the display director."

Gradually, Dave was getting further out and about on the display circuit, but his day job was still running his garage. "One day a guy called Barrie Emerson, who runs a big company in Wickham Market called Roland Group, had seen my aeroplane flying and decided he wanted one. He was a friend of Vic Norman's, and he contracted Vic to build him a Stearman, a yellow one. Barrie rang me up and asked if I could go down to Rendcomb and pick it up... We flew it back to Old Buckenham, and that also ended up at Monewden. In that hangar we had two Stearmans, mine and his, plus 'Eddie' Edwards' Harvard, G-BICE, and a Piper Cub.

"In 2006 Barrie told me Vic was looking for a pilot. He said he thought I was the man for the job. I knew there were plenty of people more experienced than me, so I rang Dave Puleston — who by now was working for de Havilland Support at Duxford — and told him there was a job going at Rendcomb and that I thought he should do it. He said he'd been for the interview and didn't want to do it, but he thought I should do it. I had a share in a Yak-52, G-BZTF, a yellow one based at Duxford [...] so I jumped in that and flew down here. I had an interview and did a test flight in Stearman N54922, and that was it. I started here in November 2006."

The AeroSuperBatics wingwalking act has been through a number of guises since it started in 1987 under Yugo Cars sponsorship. The Crunchie Flying Circus had given way to the Utterly Butterly Barnstormers, and as Dave joined another change was in the offing, with backing from French skincare giant Guinot. That switched to Breitling over the winter of 2009-10. When the Swiss watch company stepped away after 2017, the team became self-funding.

"I worked up", recalls Dave — who ended up selling his own Stearman to Paul Bennett — "and we quickly worked out in the team that it was going to be best if I led... it just seemed to be easier, and I'd done a lot of leading before, although I could fly all the other positions as well. In fact, when we did four-ships, I sometimes flew as three or four. My first ever display for AeroSuperBatics was at Old Warden in 2007, and it was for *Blue Peter* with the TV cameras there and [presenter] Zoe Salmon on my wing. No pressure!

"Initially Breitling wanted two aircraft from us, so we painted two in their colours, and we sent two others to China. That was the first China trip I'd done, to Zhuhai, and it was a real eye-opener. In China there's no light aviation. Effectively, all of the airspace is controlled by the military, so even to test-fly when we built the aircraft back up we had to ask permission 24 hours ahead. Sometimes they would cancel the permission on taxi-out. It was quite interesting dealing with the authorities in that way. For example, we were on a 4,000m runway and the lady in the tower was asking how long a final we needed. I think she was thinking 'Triple-Seven', because we were Boeings...

> ***"I got into this Chinese van at 4am and disappeared into the dark"***

"We also went to a place called Dazu, near Chongqing. I had to travel out there on my own, so I flew from London to Beijing and got a transfer flight. The London flight landed at two in the morning, and I was in the airport by myself looking for an internal flight to Chongqing. I ended up on this 737, which sounded like a bag of spanners, but off we went into the night. We landed in Chongqing, and coming out of arrivals I had to find my guide. I had no Chinese, he had no English, but I got in this copy of a Ford Transit at four o'clock in the morning and disappeared into the dark.

"At Dazu we went to the airfield, and I think there were 24 MiG-21 copies parked up, all under sheets. We weren't allowed cameras, all of that stuff. We built the aircraft in a hangar and had to push them across a public road to get onto the airfield to do our test flights. One day a Chinese guy turned up, jumped in every single MiG-21 and started them up one after the other, just to make sure they'd run. Then he shut them all down and covered them all up again. They said they were going to sweep the runway and they needed two hours for it. We were thinking that was strange — why wouldn't they just get a big truck with a brush? But no, there were about two-dozen Chinese with brushes sweeping the runway, which was 2km long.

"We've been to China 15 times now. The last time was a year ago when we went to Nanchang, which was absolutely fantastic. Every Chinese audience is huge — they've got double fences so the girls don't get mobbed. I didn't know Nanchang airport was half-civilian and half-military, so I took a load of pictures and had my 'phone confiscated by the secret service.

ABOVE: A few five-ship displays were put on by Team Guinot, as here at Shoreham in 2008. Dave says they were "a bit of a bunfight." BEN DUNNELL

Great photographer Katsuhiko Tokunaga captured the Breitling Wingwalkers for their sponsor over the Burj Khalifa in Dubai. ALAMY

BREITLING
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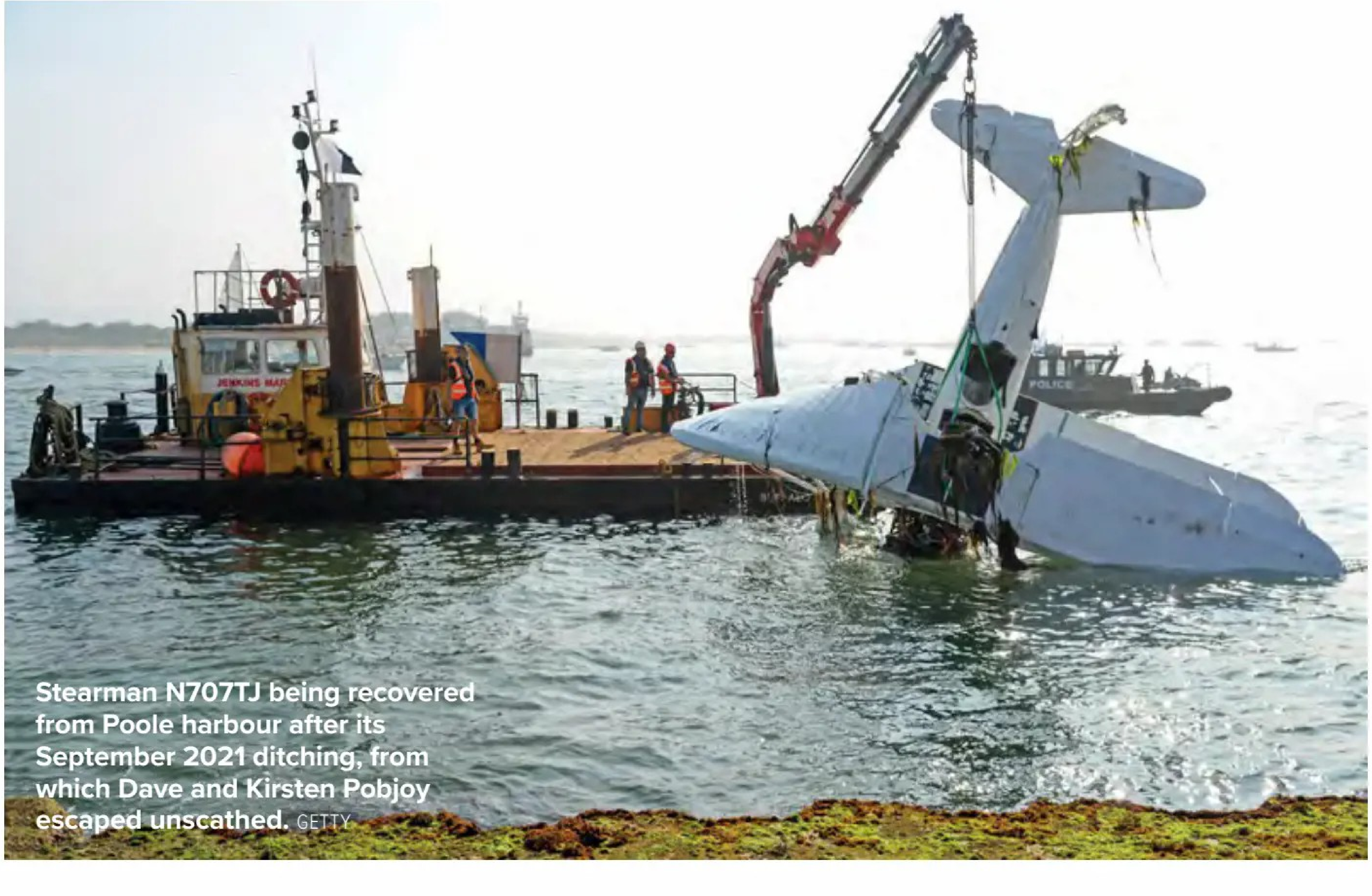

Stearman N707TJ being recovered from Poole harbour after its September 2021 ditching, from which Dave and Kirsten Pobjoy escaped unscathed. GETTY

It took me a couple of days to get it back. They were building drones that look like B-2s, they were building a twin-jet trainer [the JL-10] and they were still building Nanchang CJ-6s, rolling them out in primer, starting them up and flying them.

"We went to the Philippines for a balloon fiesta. In the Philippines the girls, Katie and Emily, had armed guards round the show site with machine guns — we hadn't really experienced that before! We did a show at the US Marine Corps base at Iwakuni in Japan, hosted by them, which was wonderful. They took us out into the local town, and we got to see the peace park in Hiroshima. In Australia we did Avalon, and in India we did Bangalore. I'd have to count, but it must be 10 times we've been to the UAE."

◆

Of those, the most memorable was surely 2016's trip. "We were doing some PR work with wingsuit parachutists, and also swooping parachutists — which go down very quickly when they're open — and a guy with a flag. The deal was we could only fly between sunrise, 06.00, and I think 10.00 because Skydive Dubai would then start up. We were operating off their little runway on legs, which looks like an aircraft carrier… We agreed they'd get out at 9,000ft and we'd be at 7,000ft, so they'd spread their wings and get into formation. As they came down, I'd keep an eye on them; the other guy was behind me in stack. They said, 'As soon as you see us, try and hit us,' so we'd dive in, they'd turn, and we got some brilliant shots of us in these turns. But we couldn't stay with them with the girls on the wings, because they were going at 70-80kt and we'd quickly go through that, which, of course, was too fast with the girls. We also got the shots with the swoopers and the flag guy, but it wasn't as effective."

After that, they flew with the Breitling-sponsored Jetman, Yves Rossy, and Jetman Dubai's Vincent Reffet, who subsequently lost his life in a training accident. "They jumped out of their helicopter, got their jet engines going, and we flew around. I was briefed to not go below 5,000ft, I think, and we did a figure of eight over the Palm to get all the shots."

There's been a lot of television work, too. "All the *Blue Peters* have been good. We did a mirror baton pass with [presenters] Radzi and Lindsey. A funny one was *A Question* *of Sport*, with Phil Tufnell and Matt Dawson. Matt Dawson didn't really like it. Most of the time Tufnell was swearing, so a lot of it wasn't usable — it would have just been 'bleep, bleep, bleep'. Robbie Coltrane came down [for his *Incredible Britain* series]; we couldn't fly him on the wing, obviously, but we flew him in the front cockpit. Tony Bellew and Jamie Redknapp were here for *A League of Their Own*. Tony Bellew I think was sick when he got off the wing. I flew Jamie Redknapp… it was his birthday the day before, so he was hungover, but he still flew and he loved it.

"The British Grand Prix was while we were with Breitling, in 2012. It was a three-ship out of Turweston; I flew Jake Humphrey, Vic flew Eddie Jordan and the number three had David Coulthard. The BBC asked if we could fly down the pit straight of the new stadium at Silverstone. There were a few cranes around, so I wasn't very comfortable, but having looked at the site I thought we could fly them over it, no problem. On the way back, Eddie Jordan had a birdstrike. The bird kind of disappeared through his legs and, I think, went to pieces on the wing strut. When we landed, I can't remember who it was but somebody came out and loudly said, 'That's the closest Eddie's been to a bird in a long time…'

"*Top Gear* has been fantastic, and the Beachy Head one for the Jaguar E-Type's 50th in 2011 was such good fun. We knew there was going to be a Spitfire and a Hurricane, we knew there were going to be hot-air balloons and we knew they were going to be at Beachy Head, but apart from that we didn't have much to go on. We were based at Lydd and Dave Walton was the display director. I don't know whether they had to have an FDD, but they wanted someone liaising on the ground, and without doubt he is the best guy…

"We were fuel-limited, so we decided we'd get out of Lydd and fly down the coast to Beachy Head. We were stooging around holding, with the girls in Union Jack outfits, the film people were faffing, and the Spitfire and Hurricane were out to sea — it was Carolyn Grace and Dave Harvey. I could see a lot of movement on the ground; they had a marching band, and they had Royal Marines abseiling down the cliff with a Union Jack the size of Gloucestershire. For us it was going to be one hit. We set up the run and we pretty much flew along the cliff-top, off the cliff. The camera shot makes it look like we were pretty much touching it, but we weren't. We flew past and climbed away. Dave said the Spitfire and Hurricane came in and did a break, but [Jeremy] Clarkson was so fixated on the aircraft, the noise and everything that he didn't say anything, so they had to go back and do it again. In the end it was successful, and when I saw the film it was absolutely brilliant. I'm really pleased I got to do that."

> **"Oil was coming past the cockpit, and I'd got a big problem"**

But if there's one date that will forever be imprinted on Dave's mind, it's 4 September 2021. With wingwalker Kirsten Pobjoy, he was leading the formation pair on the third day of the Bournemouth Air Festival, the UK's biggest seafront airshow. Stearman N707TJ had been running perfectly, there and elsewhere. Part-way through the sequence, initiating a gentle climb he noticed the rpm had dropped and the Pratt & Whitney R-985 engine wasn't responding.

"I realised I was in a bit of trouble, so I levelled off, and as I levelled off I was heading down the coast towards Sandbanks. I called on the radio and said I was knocking it off because I'd got a problem. First thing: get the girl down. You wiggle the stick and shake the wings. Kirsten looked down and I went, 'Get in the seat'. She got in the seat. Then I was trying to problem-solve, flipping the mags, the fuel pump, everything. The engine seemed to be running all right but the prop speed was down at about 1,100rpm, whereas normally it's at 1,950. At that point I noticed oil was coming past the cockpit. I thought I'd got a big problem.

"I put in a PAN call to Bournemouth Airport, saying I'd got a problem with the engine and wanted to come back. They said I could have any runway. Quickly in my head I was thinking, OK, the airport's over there but I'd have to fly across the town to get there. I'm streaming oil, I've got no oil pressure. If that engine stops over the town, I'll be in the buildings. I'm not going to do it. I thought I'd land on the beach — a Stearman on the sand will be no problem. But it was full of people. So I thought I'd fly to Sandbanks, because there the beach would be clear. It wasn't. In the meantime I

BREITLING
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DUBAI

BELOW: The late Vincent Reffet of Jetman Dubai joins up for one of the more unusual formations in the team's history.
JETMAN DUBAI

said to Bournemouth, 'Give me any field.' She came back with Parkstone golf course. I saw it off to the right; it was across a built-up area, and I thought it was going to be packed with golfers on a sunny day. Could I put a Stearman down on the fairway and risk hitting somebody? Probably not. I'll probably be safer over the water.

"Then I thought on the other side of Poole harbour there was a big, long beach. I could see it, there were no groynes on it, and if I could get there it wasn't that busy. Anybody there would probably see an aeroplane coming and get out of the way. I decided to do that. The engine was popping and banging, not running very well. I'd managed to get to about 500ft, not very high, but it was coming down again… I remembered Eskil Amdal's voice in my head, talking about when he put the Sea Fury [WG655] in the field near Cambridge, north of Duxford. All he said was, 'Keep your flying speed up.' I was trying to keep it at about 75kt.

"As I got pretty much alongside Sandbanks, there was a bang, a huge vibration — I couldn't see the instrument panel — and then the engine stopped. At that point I was at about 200ft, and I knew all bets were off. There were boats everywhere because it was the Poole harbour entrance, the Red Arrows had been on and loads of boats were going in and out. I needed a clear piece of water to put it down. There's a metal pole in the water which keeps the boats away from the concrete side, and then the Sandbanks Hotel. I decided to put it in that gap… I tried to get it into the water as slow as I could, and when they pulled it out the speedo was on 65kt, but it was still like hitting a brick wall. Over we went.

"We found ourselves upside-down. My headset was screaming with feedback because of the salt water in the electrics. We'd briefed for it so many times: airline-style belt, 'flick,' five-point harness, 'flick,' pull the lead out and up. I surfaced, turned around to get my bearings and Kirsten came up right next to me. A nice couple in their boat with their kids was quite close, and I asked them to come a bit closer… it was a little dinghy with only enough room for Kirsten, so I pushed her into it, but almost immediately a big boat came and we got into that. Then the RNLI turned up — I didn't know, but they'd actually chased us from [Bournemouth] pier."

> *"We can ship the aircraft anywhere in the world in our containers"*

Briefly hospitalised, Dave and Kirsten were released unhurt later that day. Subsequent investigation discovered the engine problem was down to a loss of oil supply, following a failure of the engine oil inlet pipe. After this splendid example of airmanship, the Honourable Company of Air Pilots presented Dave with its Hugh Gordon-Burge Memorial Award, for "a member or members of a crew whose outstanding behaviour and action contributed to the saving of their aircraft or passengers", while both he and Kirsten were inducted into the Goldfish Club. They were, respectively, back in the cockpit and on the wing within days.

Since the Breitling backing ceased, the ability to carry passengers on the wing through the Safety Standards Acknowledgement and Consent (SSAC) regulations has allowed AeroSuperBatics to generate new revenue alongside its display work. With an operator in the US having had to close down, word has even spread across the Atlantic. "We have Americans coming here who'll land on the Tuesday, fly on the Wednesday and go home on the Thursday", says Dave. From closer to home, "One guy from London has been here 14 times, and there are lots of people who've done it nine, 10, 11 times and keep coming back. At the moment, we're the only place in the world where you can fly aerobatics on the wing… and we can do formation as well."

That gives people a taste of what the professional wingwalkers experience at airshows. Of them, Kirsten Pobjoy has been with AeroSuperBatics since 2018, while Emma Broadbent joined after the COVID lockdowns. Libby Dover-Smith was a member back in the Utterly Butterly days before going off to fly corporate jets, but she came back prior to the 2020 season. They run the social media, while Dave deals with airshow bookings, logistics for overseas trips and so on. The latter always present their own challenges, but experience has taught the team a great deal.

"We have our own containers, which means we can ship anywhere in the world. The aeroplanes break down into the major components: four separate wings, the centre

BELOW: Chinese audiences had never witnessed wingwalking before AeroSuperBatics first went there, and their interest has never diminished. This was the most recent occasion, 2023's Nanchang Air Show at Yaohu Airport. GETTY

BELOW RIGHT: Wrapped up warm against the British summer elements. Some of the transits Dave and his colleagues undertake in these open-cockpit biplanes are quite remarkable. VIA DAVE BARRELL section and the rig. The propeller comes off, the flat part of the tailplane comes off. We have a metal framework that holds all those components, which we push into the containers and bolt to the walls, so even if the container goes upside-down it can't fall out. The toolboxes as well are bolted in; they were strapped in, but we've changed it now. Then the fuselage is pushed in and strapped down. We can do all of that in about a week, packed into two containers. We have to do the logistics with a company, so I'll liaise with them, and then it's just a case of getting a crane in, or a lorry with a crane on it. They'll pick the containers up and off they'll go.

◆

"For China it's two months at sea, and everything's tracked so we can see where they are at any point. When that ship got stuck sideways in the Suez Canal, our aircraft were on their way back, but they weren't anywhere near it so it was all clear by the time they got there. We can monitor things like that. They get roaded to wherever they need to be in the country they're going to, and the aircraft generally arrive in their containers at roughly the same time as we arrive as a four-strong team to build them, because you need four people to lift the top wing on. Usually we take Matthew Boddington, Gordon McDill, me and the other pilot, which last year was Steve Noujaim.

"On the break-down it's the opposite… we take the aeroplanes apart over two or three days, pack the containers, put them on the ship and send them home, or to the next show. In China you can't fly between shows. Even if the show's down the road, 100 miles away, you have to pack the containers up and take them."

ABOVE: Crossing over during the Philippine International Hot Air Balloon Fiesta at Clark Field, Pampanga in February 2018. ALAMY

Make no mistake, while it's a lot of fun, the workload can be intense. And although these 450hp Stearmans may be very different animals when compared with the 'stock' trainer, it still involves proper, old-fashioned flying, especially on the longer European transits. Some have been quite extreme, like the time Dave led a two-ship all the way from Stans-Buochs in Switzerland to Linköping in Sweden, but even destinations that might sound closer at hand involve some notable journeys. "If we get a show on the south coast of France, that's a two-day trip each way. We've been to Cascais in Portugal, and also to Portimão, which was a four-day trip to get there — all hand-flown in an open cockpit. When we did it, there was no SkyDemon or anything. We used a [Garmin] GPS 90 with maps, landing every hour and 40 minutes for fuel because we were two hours to tanks-dry.

"We've ended up in some strange places, because you plan A to B but you actually take a swathe about 50 miles wide and try to stay within that in case of weather, airfields being closed or whatever. France is a massive country, so its airfields are more spaced out than ours and you need to have a plan B all the time. We did a show in Venice, and flying back through the south of France we went up the Rhône valley, into the mistral. It was coming down the valley at probably 50kt, and we were going the other way at 90kt, so we were down at 40kt over the ground. You're quickly working out you haven't got enough fuel to get where you want to go, so you need to land. We went into Montélimar, topped up, got going again and realised that if we climbed out of the valley, went 20-30 miles to the side and kept going, our ground speed would go up, so that's what we did."

In the season just gone, AeroSuperBatics celebrated the 40th anniversary of Vic Norman founding the company with a special, private 'do' at Rendcomb. The wingwalkers represent probably the longest-running, continually active, professional civilian display team in the world, and their record is second to none. Dave says, "People come to us and say, 'We've got this idea' — a lot of it is a 'no', because we've pretty much done everything there is to be done with an aircraft with somebody on the wing. Vic's been 40 years in the business, and he is highly experienced. The visions he has are fantastic."

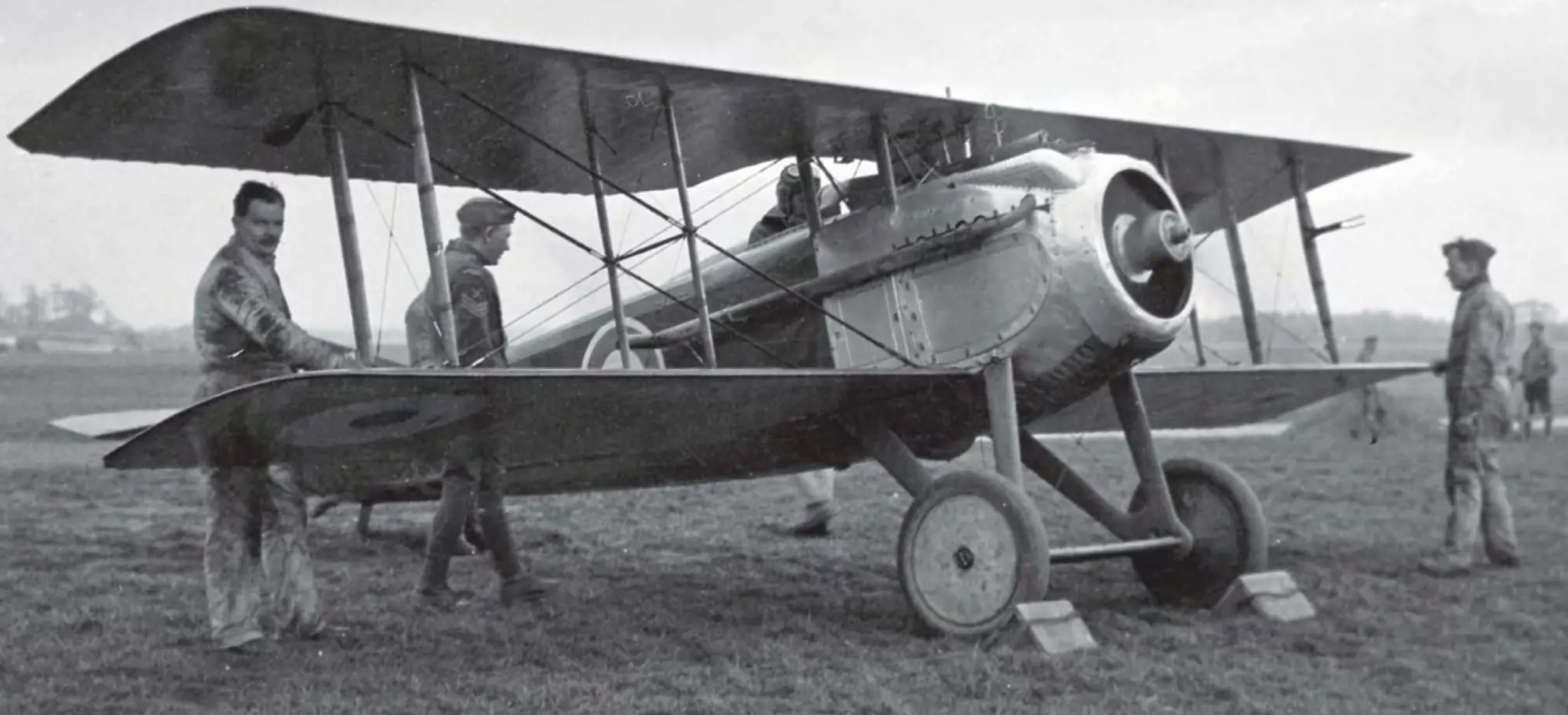
And now, just as Vic did for so long, Dave is helping bring on the next generation as a display authorisation evaluator and mentor for new display pilots. "I hate blowing my own trumpet", he says, "but with my experience I thought it was time to give back". In that the CAA's Paul Szluha, a long-time friend, proved a great help. Paul's father Tibor had been his boss in his first job with The Welding Institute. It's a small world!

A very satisfying one, too. "I absolutely love coming to work", Dave says. "I've almost always liked what I've done, but I love this… To fly people and see their faces afterwards is just great. And the wingwalkers, when we land and they've done a good show, are over the moon. For me, that's it."

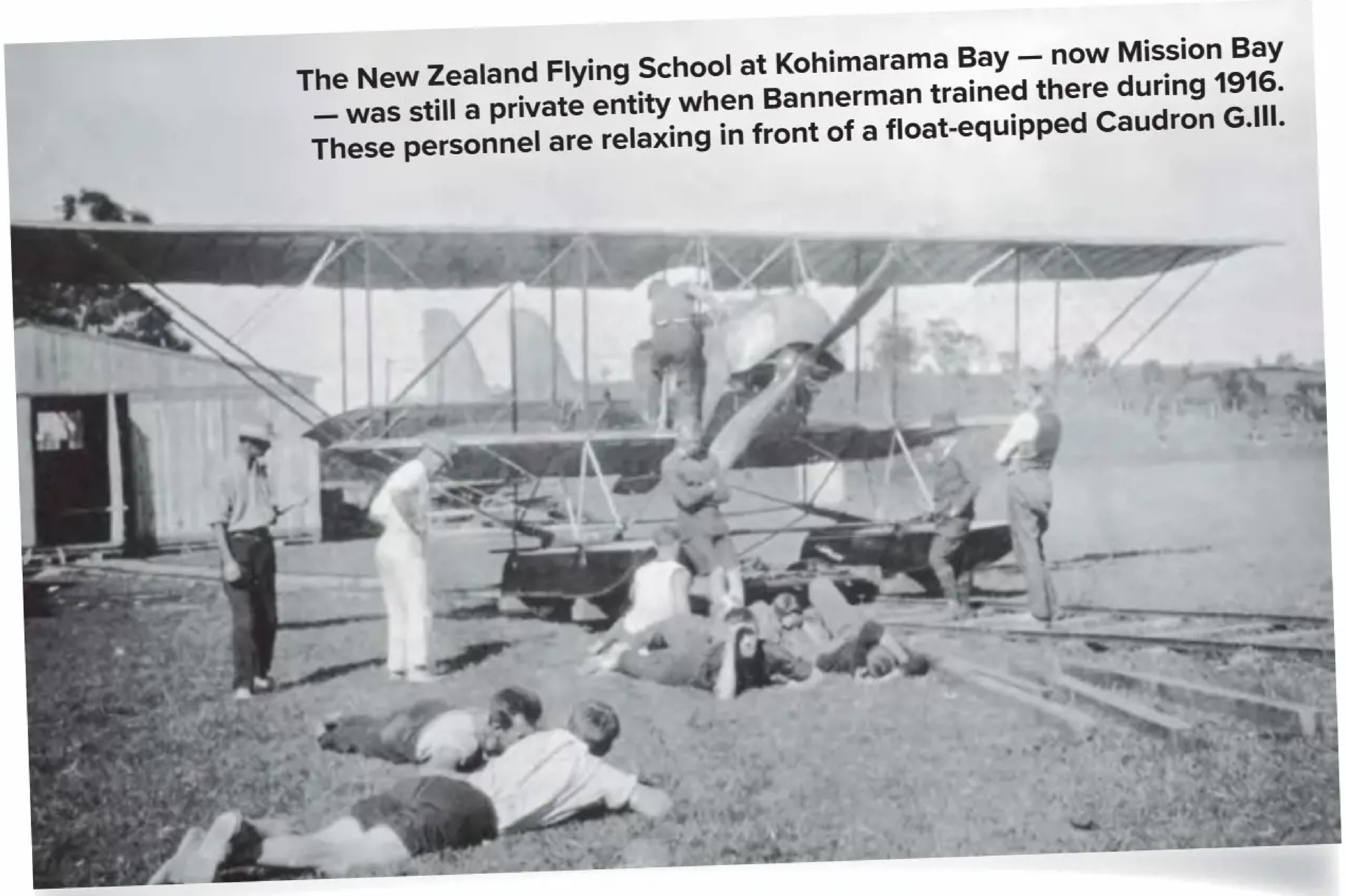
NEW ZEALAND WW1 ACE

Later achieving the rank of air commodore, **Ronald Bannerman** was New Zealand's highest-scoring ace of the First World War, scoring 17 aerial victories in the Sopwith Dolphins of No 79 Squadron, RAF. Some of his personal photos, now held by the Air Force Museum of New Zealand, detail his early flying days

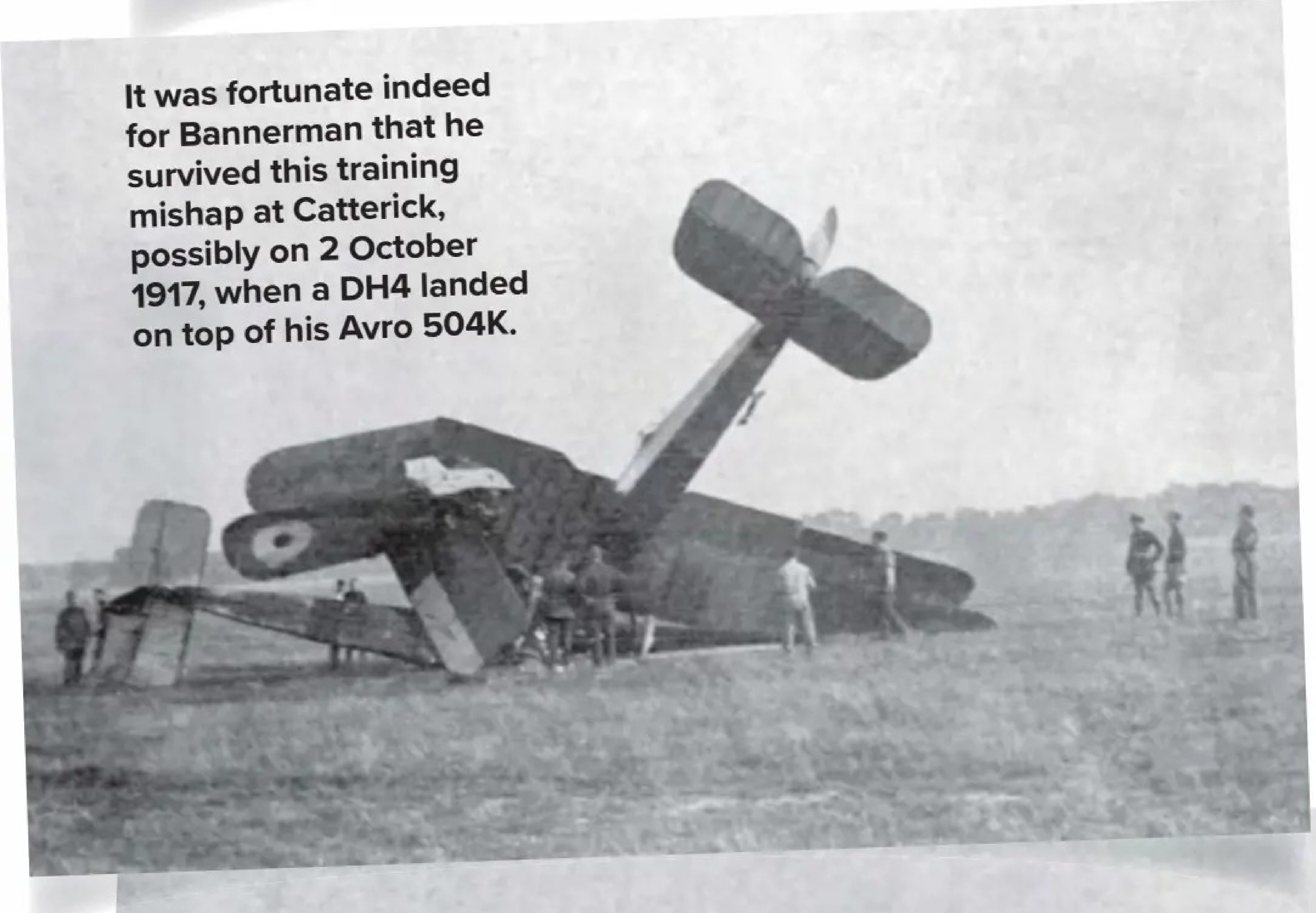
Bannerman with his camera. The images he captured are some of the most varied and comprehensive taken by a First World War RAF pilot.



An engine run for SPAD VII A8879 at Catterick, where Bannerman received instruction with No 46 Training Squadron, RFC. Riggers help keep the aircraft steady.


The New Zealand Flying School at Kohimarama Bay — now Mission Bay — was still a private entity when Bannerman trained there during 1916. These personnel are relaxing in front of a float-equipped Caudron G.III.

Ready for a patrol in a Sopwith Dolphin. Bannerman's first aerial victory was against a Fokker D.VII on 4 August 1918 and his last on 4 November. His most regular mount was C3879, in which he notched up 14 of his 17 successes.


It was fortunate indeed for Bannerman that he survived this training mishap at Catterick, possibly on 2 October 1917, when a DH4 landed on top of his Avro 504K.

It was on a Curtiss Model F such as this machine that Bannerman gained his aviator's certificate in mid-December 1916.

Sopwith Dolphins of No 79 Squadron, to which Bannerman was posted in February 1918, while it was still an RFC unit — and around the time it moved to France. The closest example is C4046.

Have you got photos to contribute to Personal Album? If so, e-mail the editor at ben.dunnell@keypublishing.com

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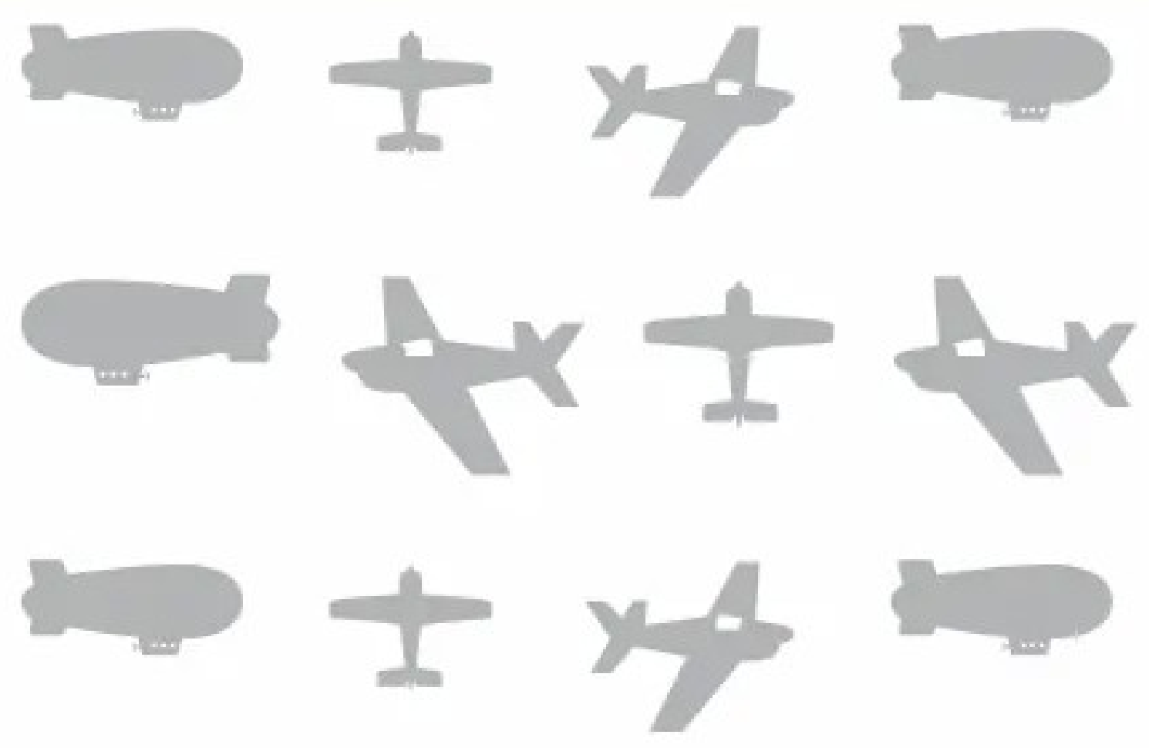

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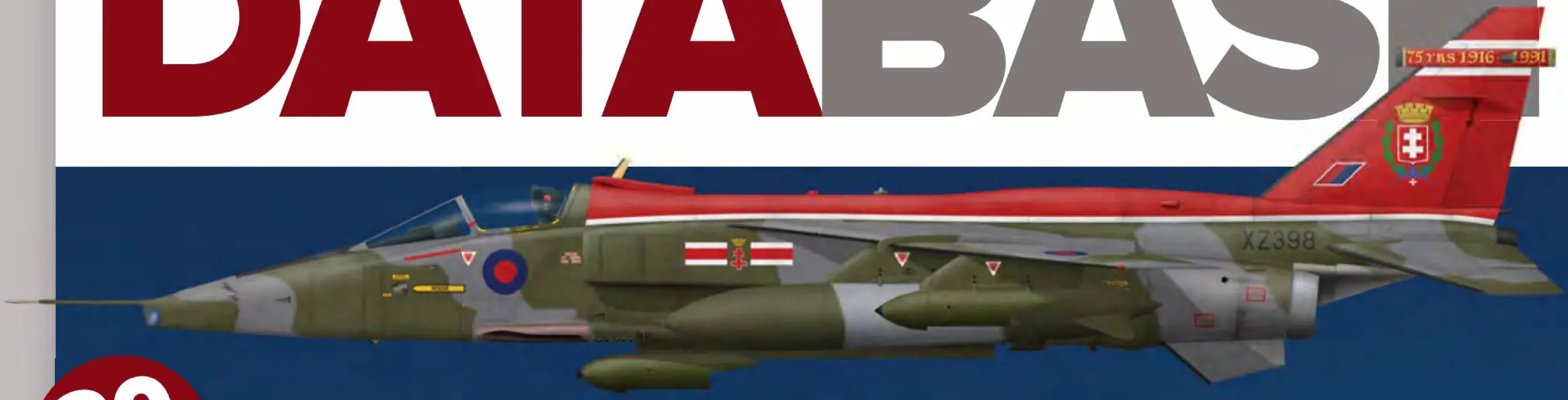
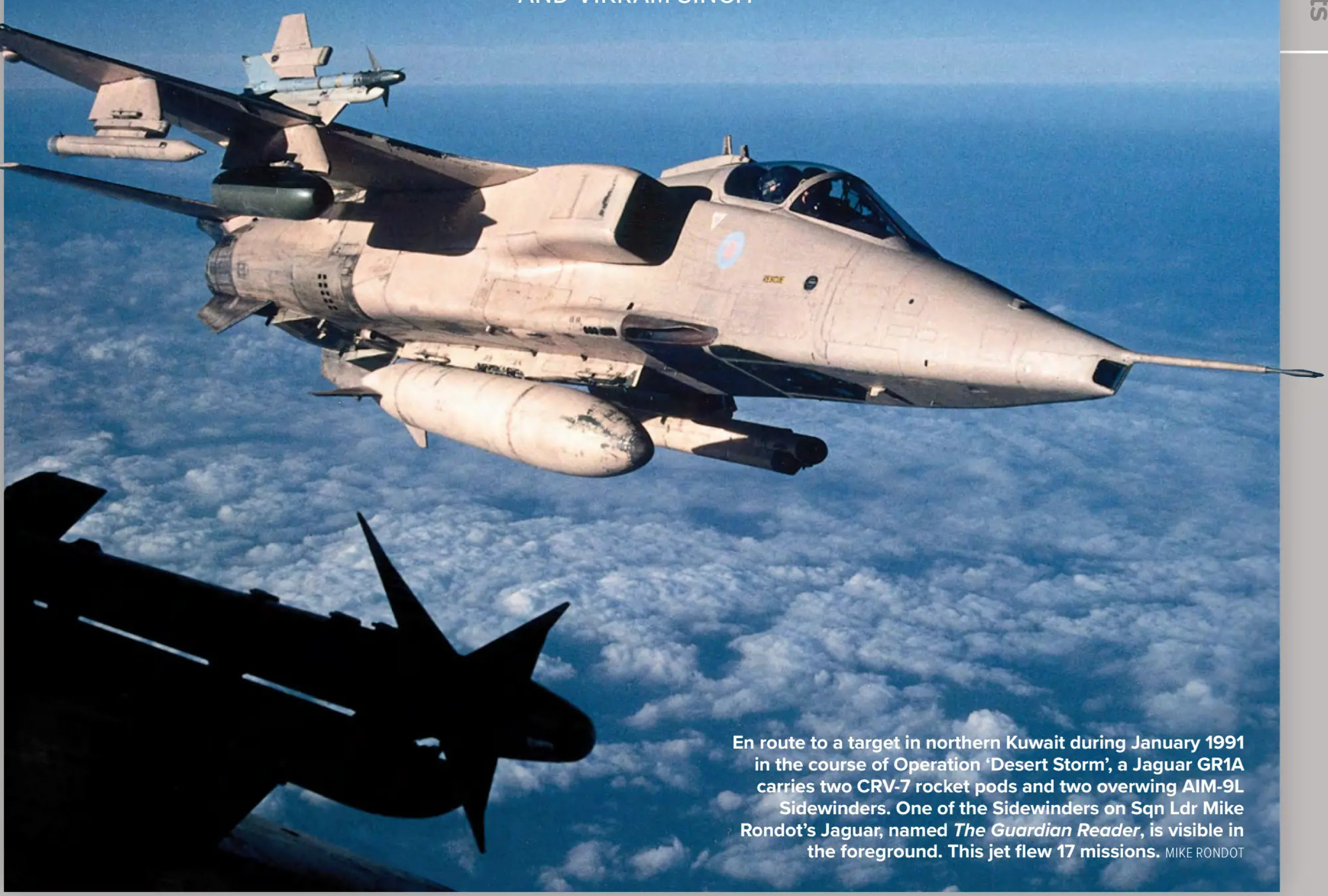


20 IN-DEPTH PAGES

No 41 Squadron painted Jaguar GR1A XZ398 with a red fin and spine to celebrate the unit's 75th anniversary in 1991. It continued to wear these markings until at least 1994. CHRIS SANDHAM-BAILEY

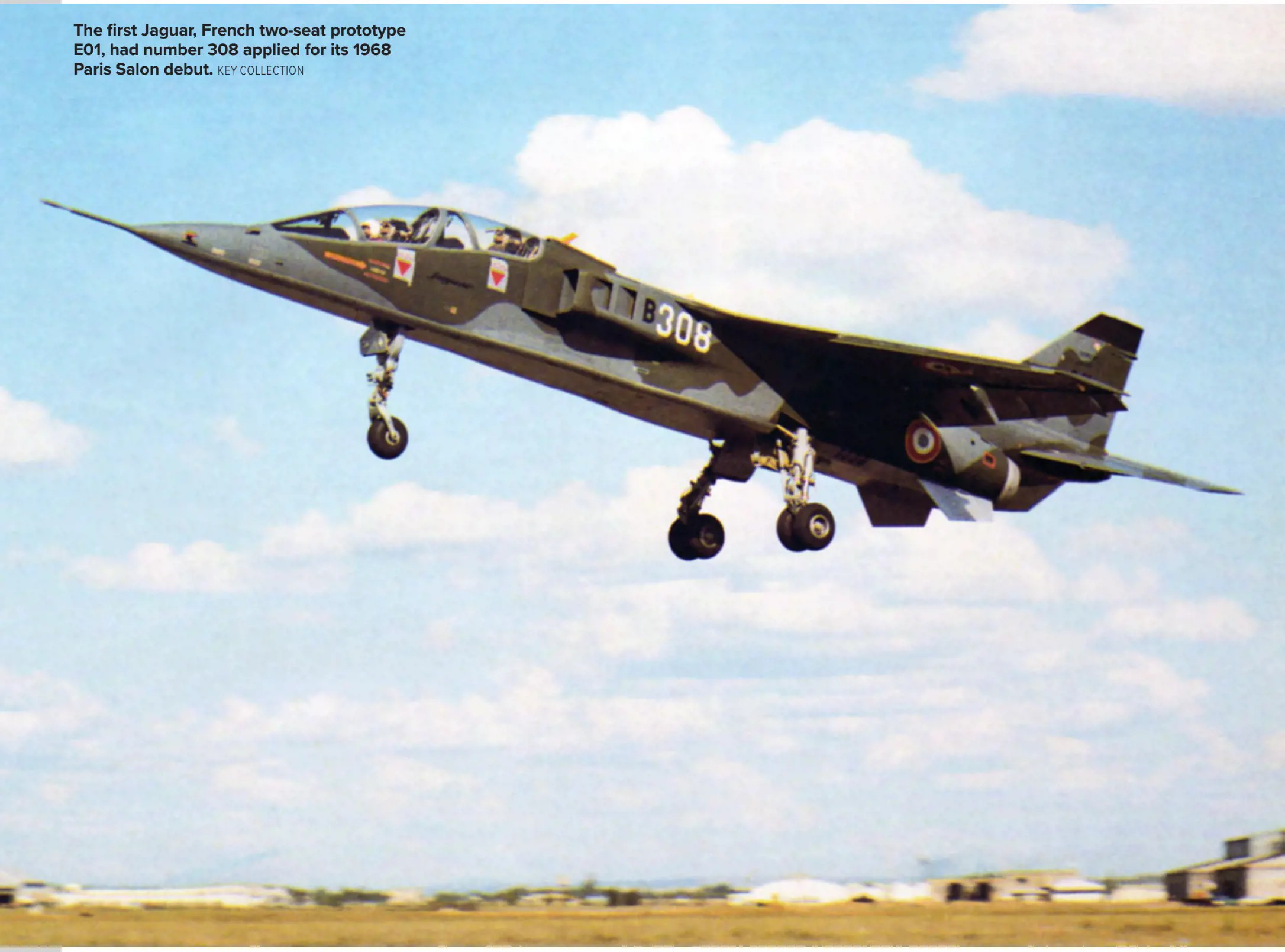
SEPECAT JAGUAR

WORDS: DENIS J. CALVERT with PIERRE-ALAIN ANTOINE AND VIKRAM SINGH



En route to a target in northern Kuwait during January 1991 in the course of Operation 'Desert Storm', a Jaguar GR1A carries two CRV-7 rocket pods and two overwing AIM-9L Sidewinders. One of the Sidewinders on Sqn Ldr Mike Rondot's Jaguar, named *The Guardian Reader*, is visible in the foreground. This jet flew 17 missions. MIKE RONDOT

How French and British requirements coalesced around a new strike aircraft — and led to a success story



The first Jaguar, French two-seat prototype E01, had number 308 applied for its 1968 Paris Salon debut. KEY COLLECTION

Having signed the initial Jaguar production agreement in London on 9 January 1968, British Defence Secretary Denis Healey (left) and French Defence Minister Pierre Messmer inspect a model of the aircraft. ALAMY

Built as both a two-seat advanced trainer and a single-seat light strike/attack aircraft, the Jaguar was developed and produced by the catchily named Anglo-French Société Européenne de Production de l'Avion d'Ecole de Combat et d'Appui Tactique, or SEPECAT. Its story underlines both the advantages of an international programme — economies of scale and the relative stability that comes from the difficulty experienced by either partner, should it want to leave — and the disadvantages: the involvement of two sets of politicians and the possible effects of self-interest by one partner or the other. The Jaguar suffered its fair share of challenges, but the fact that examples are still in front-line service in India 56 years after the type's first flight must qualify the project as a success.

On the British side of the English Channel, Air Staff Target 362 was issued in 1963 for an advanced pilot trainer to replace the Gnat T1 and the two-seat Hunter in RAF service. At the same time, the French wanted something similar, a step up from the Fouga Magister jet trainer and a successor to the T-33, while they also saw the aircraft serving in the strike/attack role. The similarity of the two countries' needs and the political desire to launch another Anglo-French project in the wake of Concorde, which was then going well, led to a decision to issue a joint specification.

Ready for the fray, Breguet Aviation already had its Br121 lined up to meet such a requirement. Better, it was proposed in five versions, to meet any and all possible roles from trainer to interceptor, even though interception was not part of the French requirement. Its two-seat design incorporated a pair of reheated turbojets giving a maximum speed of Mach 1.8 at altitude, this at the same time as the French requirement increasingly emphasised the 'appui tactique' light strike/attack role. Surprisingly, Breguet's design looked very similar to that which would later emerge as the Jaguar.

In Britain, both the British Aircraft Corporation and Hawker Siddeley put forward designs, some of which were overkill for the pure training role, with BAC's P45 proposal for a supersonic trainer and light strike aircraft featuring variable-geometry wings. Out of this melee came the joint decision to proceed with two separate programmes. The trainer/light strike requirement would be met by a design based on the Br121, Breguet having project lead status with BAC as partner.

As a quid pro quo, the P45 design would be the basis for a second Anglo-French programme as the Anglo-French Variable Geometry (AFVG) aircraft, on which BAC would take the lead. A memorandum of understanding was signed on 17 May 1965, formalising both. The AFVG was seen by the RAF as a replacement for its cancelled TSR2, and thus critical to its front-line capability. Unfortunately, as history records, it too would be cancelled in June 1967 when the French withdrew, ostensibly for cost reasons but also, it might appear, to pursue purely French variable-geometry Dassault Mirage designs to meet Armée de l'Air (AdlA) requirements.

A full-size model of the single-seater appeared at the Paris show in 1967.

> *"Breguet's design looked like that which would emerge as the Jaguar"*

The name Jaguar was announced in June 1965 for the trainer/light strike aircraft, the SEPECAT joint company was set up in May 1966 by BAC and Breguet, and a cross-Channel Joint Management Committee put in place. At the behest of the French government and with the aim of ensuring the success of the Jaguar project, Breguet Aviation would take over the assets of the Dassault company in 1971, renaming itself Avions Marcel Dassault-Breguet Aviation (AMD-BA). This made little difference organisationally but brought the industrial heft of Dassault to bear on the Jaguar programme.

Initial requirements were announced whereby the RAF and the AdlA would each receive 150 Jaguars. In the RAF's case, all 150 would be of the trainer version, while the AdlA requirement was for 75 two-seat E trainers (E for école) and 75 A (A for appui) single-seat combat aircraft. These totals were increased some months later to 200 for each country. Then,

DATAFILE

JAGUAR VARIANTS *(manufacturer's designations)*

Jaguar A

Single-seat version for AdlA strike/attack role with two 30mm DEFA cannon, five underwing and centreline stores pylons and provision for in-flight refuelling

Jaguar E

Advanced trainer for AdlA with two 30mm DEFA cannon, five weapons pylons and no in-flight refuelling probe

Jaguar M

The late addition to the Jaguar family, a single-seater for the Aéronautique Navale (often styled as Aéronavale); revised undercarriage with extending nosewheel, stressed for the higher sink rate involved in landings aboard an aircraft carrier; strengthened arrester hook stressed to 5.5g; nav/attack system similar to Jaguar A

Jaguar S

Single-seat strike/attack variant for the RAF, introduced as the Jaguar GR1; two 30mm ADEN cannon, provision for in-flight refuelling, Martin-Baker Mk9 ejection seat with zero-zero capability; nav/attack system built around Ferranti Navigation and Weapon Aiming Sub-System (NAVWASS)

Jaguar B

British trainer with same ejection seat and nav/attack system as S model, only one 30mm ADEN cannon; entered service as Jaguar T2

Jaguar International

An export variant, based on the RAF Jaguar GR1 or T2; overwing pylons for Matra R550 Magic or AIM-9 Sidewinder AAMs, this to free up underwing pylons for other stores; Adour 804 or later

DATAFILE

THE CARRIER JAGUAR

Jaguar M05, prototype of the intended single-seat variant for Aéronautique Navale use, flew from Melun-Villaroche on 14 November 1969, piloted by Breguet's Jacques Jesberger. Six days later, Bernard Witt flew it to Istres, where it would embark upon its test programme. Later, in April 1970, testing took it to the Royal Aircraft Establishment at Bedford where it made catapult launches from the simulated carrier deck, as well as arrested landings. These trials complete, M05 then embarked in the carrier *Clemenceau* for trials at sea, with the ship operating in the Bay of Biscay. Although M05 was periodically grounded for modifications, it was able to take part in both the 1970 SBAC display at Farnborough and the 1971 Le Bourget Salon.

Testing, particularly when embarked, revealed shortcomings. It was considered underpowered for carrier use. This required it to use afterburner for take-off which, combined with the extended nosewheel leg which angled the Adours' thrust line downwards, led to damage to the carrier's deck. The Jaguar M's single-engine performance was also criticised, although it was single-engined Étendard IVs and F-8E(FN) Crusaders that formed the Aéronavale's front line at the time, seemingly without objections. It was also said to be too costly, but — costly compared with what?

For these reasons and others — including, cynics might say, the fact that the Jaguar was only 50 per cent French — the Aéronavale cancelled the Jaguar M in January 1973, selecting instead an upgraded version of Dassault's 'all-French' Étendard IV as the Super Étendard, which stayed in service until 2016. Following use on spinning and load-carrying trials, the last flight of M05 took place on 12 December 1975. It is now preserved in the Musée de l'Aéronautique navale in Rochefort. See the July 2021 *Aeroplane* for the variant's full story.

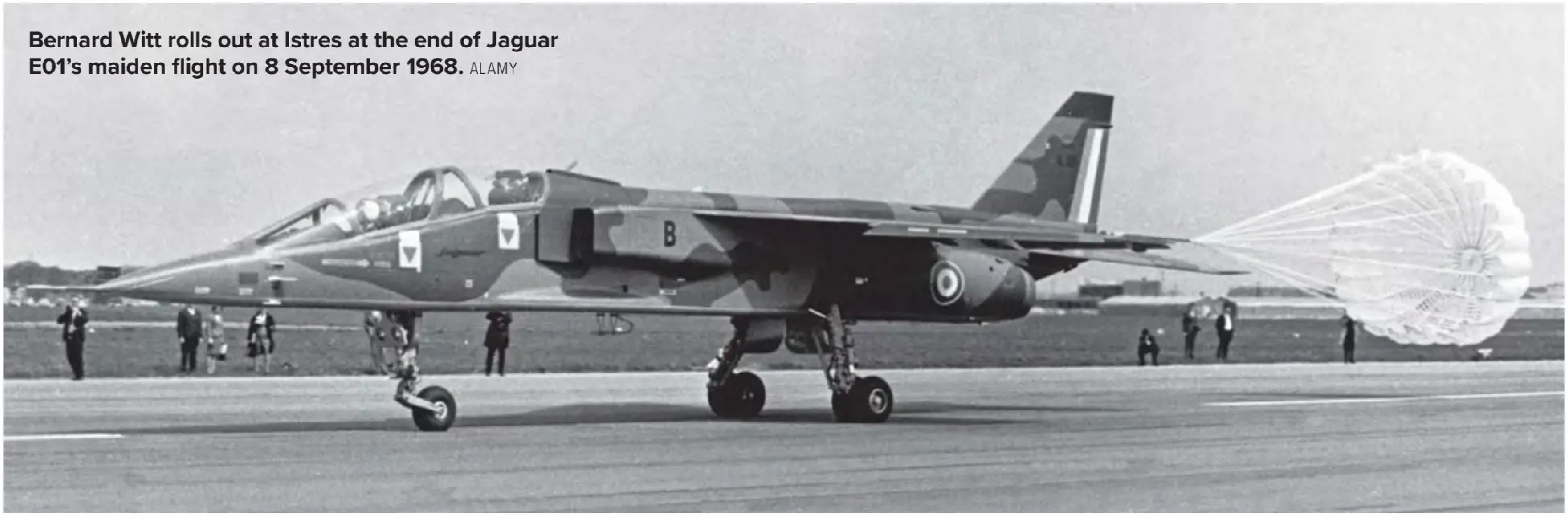
The sole, very purposeful-looking Jaguar M spent time during April-May 1970 on trials at RAE Bedford. CROWN COPYRIGHT

in a final revision in late 1970, things changed again. The RAF would take 165 aircraft as the S (British strike) variant and 35 of the two-seat B (British trainer) version. France, meanwhile, would add 10 two-seat trainers for the Aéronautique Navale, along with 40 of a new carrier-capable M (for marine) variant. When the M was later cancelled, the French order was adjusted to 160 A light strike/attack jets and 40 E trainers.

The joint manufacturing effort involved 'single-source' provision, with BAC making the rear fuselage, wings and tail while Breguet was responsible for the main fuselage sections, but two final assembly lines were set up, one in the UK at Warton, Lancashire and the other in France at Colomiers, in the suburbs of Toulouse. The powerplant selected for the Jaguar was the RT172 Adour turbofan, a joint venture between Rolls-Royce and Turboméca, which would again have its components single-sourced but be assembled on lines at Derby and Tarnos, the latter plant set up specifically for this engine. The choice of the Adour might be seen as a bold move, since it was an all-new engine that would make its initial flight when the first Jaguar took to the air. In a concession to the French side — or a look into the future — the Jaguar project used the CGS (metric) system for all measurements.

> ***"Bernard Witt reported after the first flight, 'Jaguar flies very well'"***

Eight prototype Jaguars were built, one or two of each of the five initial Jaguar variants. E01, a two-seater, made its first flight from the test centre at Istres on 8 September 1968, piloted by Breguet's Bernard Witt. He reported afterwards, "Jaguar flies very well" and, "I had no problems", although this example would crash at Istres on 26 March 1970 after an engine fire. E02, the second two-seater, followed it into the air on 11 February 1969. Single-seater A03 flew on 29 March 1969; then A04 on 27 May 1969, this time piloted by BAC's Jimmy Dell. The prototype British single-seater S06 made its maiden flight from Warton



Bernard Witt rolls out at Istres at the end of Jaguar E01's maiden flight on 8 September 1968. ALAMY

A formation of the initial three prototypes, Jaguars E01, E02 and, nearest, A03. The single code letters represent the last letters of the French civil registrations assigned to each as callsigns: respectively F-ZWRB, 'C and 'D. DASSAULT

on 12 October 1969, with Dell at the helm. The flight lasted 50 minutes and he used the occasion to go supersonic. S07 followed on 12 June 1970. Finally, B08 took to the air from Warton on 30 August 1971, this an aircraft close to production standard.

Flight-testing continued while a build-up to production got under way, each partner country having firmly committed to purchasing 200 examples. Early in 1971, the RAF set up a team of engineers to examine every aspect of the Jaguar, to familiarise themselves with it and plan how it was going to be supported and serviced once it reached the squadrons. S07 was used for this exercise, which was conducted over two weeks at Warton. In parallel, flight-testing was going well, although A03 was written off after an engine fire while on a test flight on 14 February 1972.

By late 1971, the early-production aircraft were moving along the lines at both Warton and Colomiers. First to fly was French trainer E1, which took to the air on 2 November 1971. The first production Jaguar from the British line followed on 12 October 1972, when XX108 (c/n S1) took off from Warton for its maiden one-hour 11-minute flight. This aircraft has proved a survivor; it was never issued to the front line, remaining on test duties throughout its life, and was retired in 2003 to IWM Duxford, where it now hangs from the roof in AirSpace. Next off the Warton line was XX109 (S2), the first to be fitted with

DATAFILE

The fly-by-wire Jaguar FBW, later known as the ACT, completed 96 flights between 1981 and '84 following modification to this form. BAE SYSTEMS

RAF JAGUAR MARKS AND DESIGNATIONS

Jaguar GR1: 'baseline' single-seater

Serials:
XW560 (S06), XW563 (S07)
XX108-XX122
XX719-XX768
XX817-XX827
XX955-XX979
XZ101-XZ120
XZ355-XZ378
XZ381-XZ400
Total: Two prototypes, 165 production aircraft

Jaguar GR1A: Aircraft with Ferranti FIN 1064 digital inertial navigation system (INS) as a replacement for the NAVWASS of the GR1; fitted to the fleet through the mid-1980s, this offered improved accuracy and better capability for a first-pass attack; 70 aircraft were so modified

Jaguar GR1B: Designation — possibly unofficial — for a batch of 10, or possibly 12, single-seaters modified to carry the GEC-Marconi TIALD (Thermal Imaging Airborne Laser Designator) targeting pod under an August 1994 urgent operational requirement

Jaguar GR3: Aircraft having received the Jaguar 96 modifications, these including a new HUD, a new GPS integrated with FIN 1064 and TIALD compatibility

Jaguar GR3A: Aircraft having received the Jaguar 97 modifications, revolving mainly around the cockpit equipment and displays, and incorporation of a helmet-mounted sighting system; intended as the standard to which single-seaters in the RAF's 'long-term fleet' — those expected to serve until 2009 — would be brought; XZ399 was the Jaguar 97/GR3A trials aircraft

Jaguar ACT: A demonstrator — a modified Jaguar S, XX765, with large leading-edge extensions and fly-by-wire controls; flight trials from late 1981; 96 flights total in this configuration

Jaguar T2: 'baseline' RAF two-seater

Serials:
XW566 (B08)
XX136-XX150
XX828-XX847
XX915-XX916 for ETPS, Boscombe Down
ZB615 for RAE Farnborough
Total: One prototype, 35 plus three 'extra' production aircraft

Jaguar T2A: Aircraft fitted with Ferranti FIN 1064 digital INS as a replacement for the NAVWASS of the T2; 14 (some reports show 19) aircraft so modified

Jaguar T2B: Designation — possibly unofficial — for a batch of two two-seaters modified to carry TIALD under a 1994 UOR

Jaguar T4: Aircraft having received the Jaguar 96 modifications, these including a new HUD, a new GPS integrated with FIN 1064 and TIALD compatibility

S06, serial XW560, was the first British Jaguar prototype. BAE SYSTEMS

ABOVE: Jaguar International titles were applied to GR1 XX108 for its Farnborough displays in 1974. DENIS J. CALVERT

the LRMTS — Laser Ranger and Marked Target Seeker — in the 'chisel' nose, an essential component of the RAF's avionics fit. It started out by being used for stores clearance, to prepare the RAF GR1 for squadron use with a wide variety of armament to hang from the five pylons.

The RAF's Jaguar GR1, even at its 'as-delivered' standard, had an avionics fit considerably more capable than that fitted in the AdlA's A model. With its Marconi-Elliott Navigation and Weapon Aiming Sub-System (NAVWASS) nav/attack system, the Ferranti-built LRMTS and the addition of a fin-mounted radar warning receiver (RWR), the GR1 was very much 'state of the art'. The RAF's T2 was also to some extent combat-capable but lacked the LRMTS and had only one cannon fitted.

The Jaguar would go on to achieve good if not spectacular sales success in the export market through the Jaguar International, based on the RAF's GR1 but with extended capabilities. A sales brochure of the time extolling the Jaguar International's qualities quoted an un-named Jaguar user — said to be Wg Cdr John Walker, the 'boss' of the Jaguar Conversion Team at Lossiemouth in 1973 — as saying, "The object is to put the bomb on the target and Jaguar does this better than anything else we have."

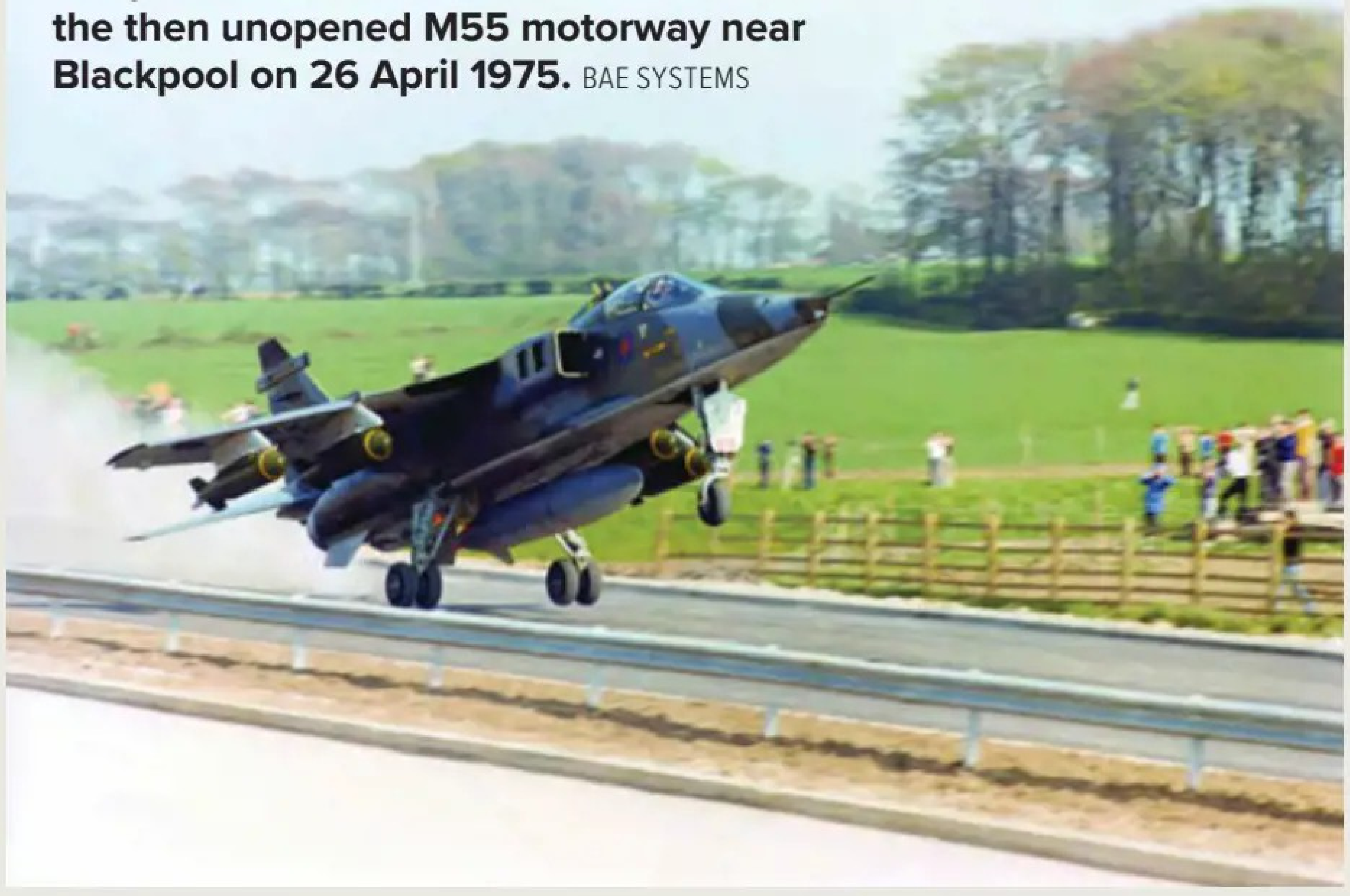
> *"The RAF's Jaguar GR1 was very much 'state-of-the-art'"*

Through the type's service life, its avionics would be updated, additional weapons cleared for use and uprated engines fitted, giving rise — in the RAF scheme of designations — to several new mark numbers. In the RAF's case, all its production single-seaters 'as built' were designated GR1, while all the two-seaters were originally T2. Some changes were made to the aircraft without any change of designation. One such was the replacement of the Adour 101, the first production variant of the engine, or the Mk102, which had part-throttle afterburner and increased thrust in both dry and afterburning regimes, by the improved Mk104. Fitted from 1978, this Adour offered a further increase in thrust, the 25 per cent improvement being more than welcome for the Jaguar's low-level penetration role.

DATAFILE

ON THE ROAD

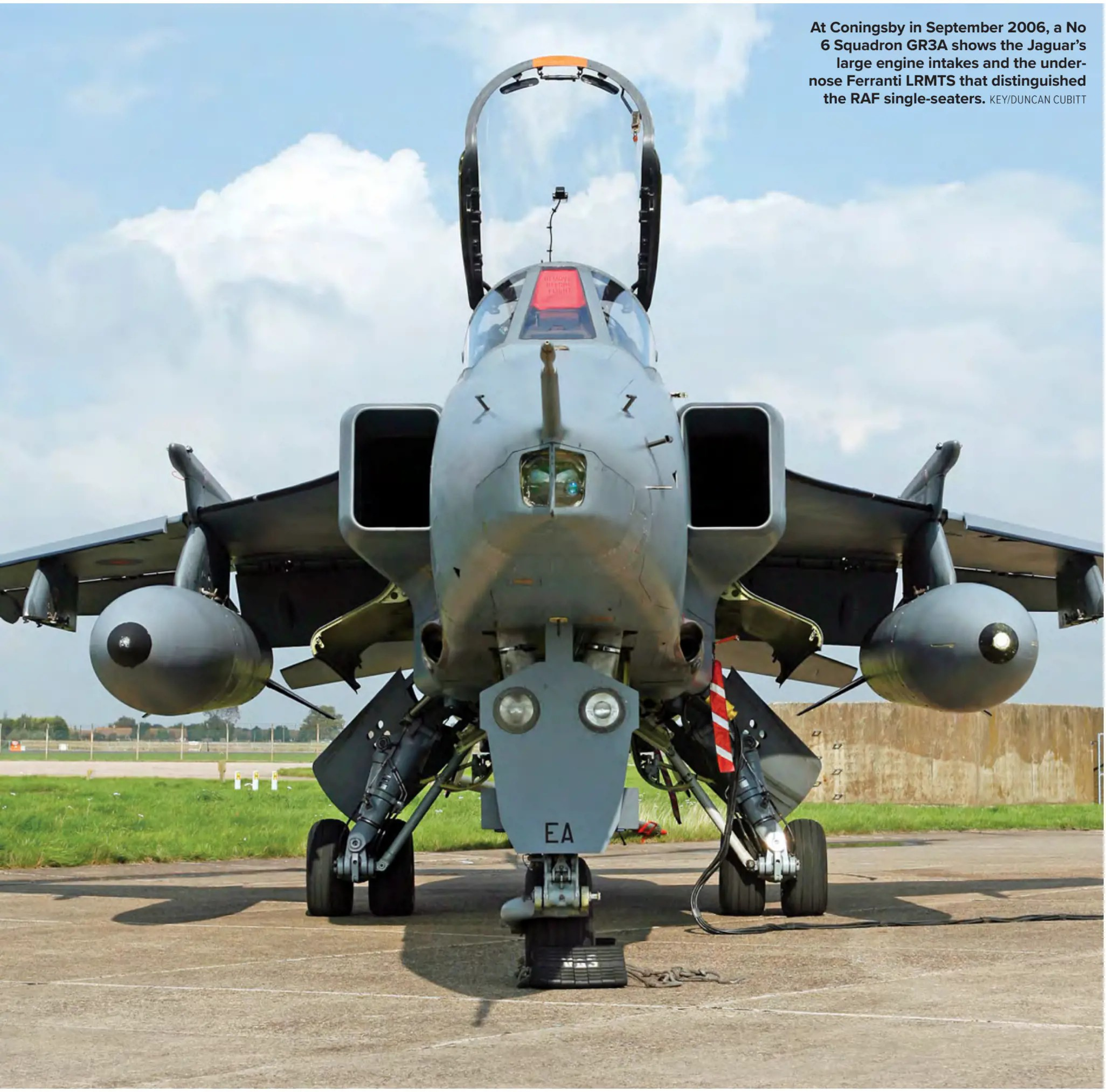
Early in the Jaguar's service career, a demonstration of its basing flexibility was given when BAC's Tim Ferguson landed GR1 XX109 on a section of the M55 motorway — which at the time was still under construction — on 26 April 1975. The landing, achieved with the use of a brake 'chute, needed only 450 yards, while take-off was achieved in 600 yards. Film of this event shows the aircraft passing under a road bridge on its take-off run. It has long been a mystery as to why the RAF ordered the Jaguar in greater numbers than the first-generation Harrier, this despite the Harrier's unique (at the time) V/STOL capabilities. Were the demonstrations on the M55 intended to convince the RAF and the 'men at the ministry' that the Jaguar had a comparable basing flexibility and a greater warload?



Pre-production GR1 XX109 takes off from the then unopened M55 motorway near Blackpool on 26 April 1975. BAE SYSTEMS

TECHNICAL DETAILS

This tough design showed its ruggedness in different combat theatres

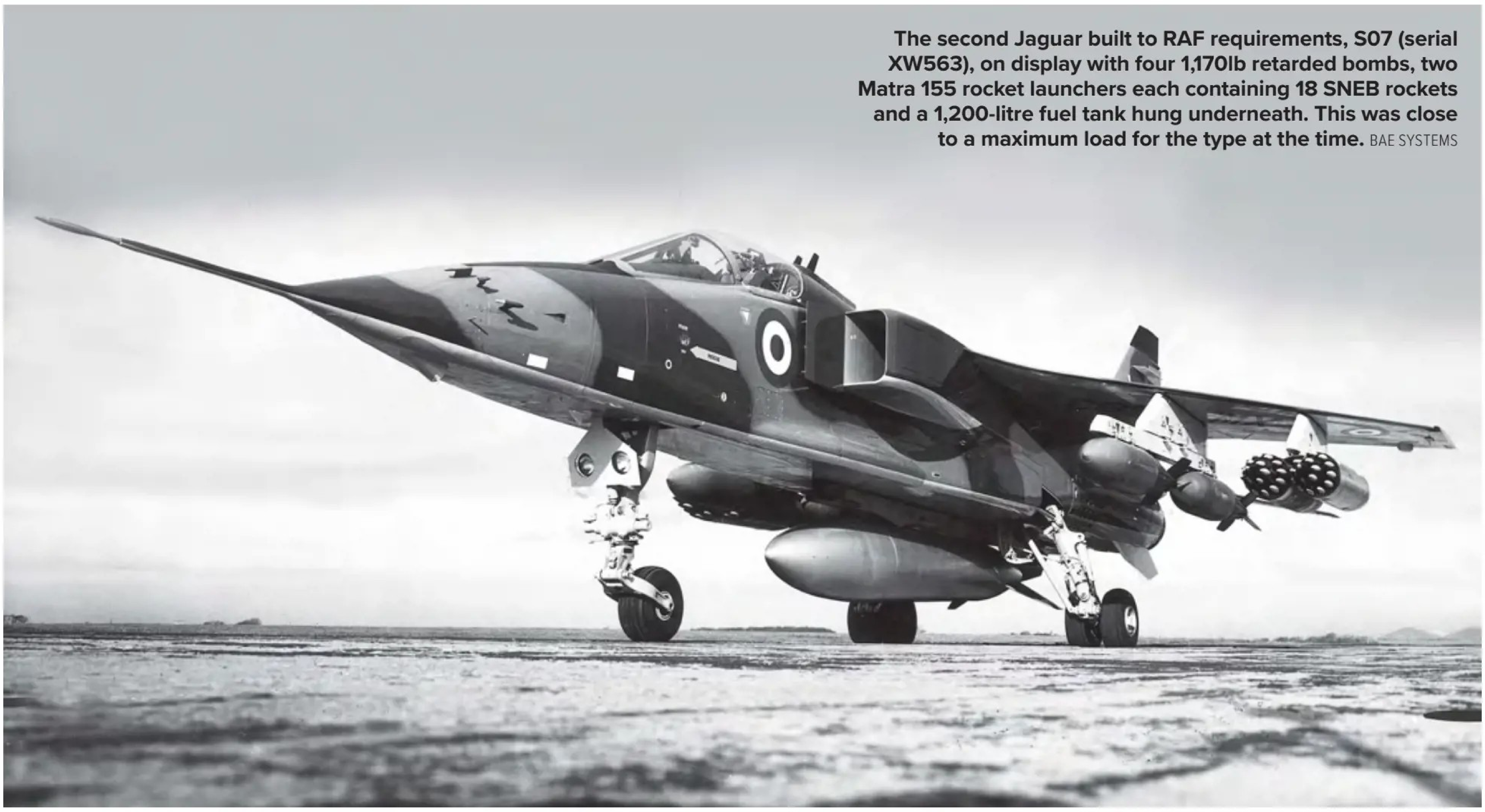

At Coningsby in September 2006, a No 6 Squadron GR3A shows the Jaguar's large engine intakes and the under-nose Ferranti LRMTS that distinguished the RAF single-seaters. KEY/DUNCAN CUBITT

The Jaguar's construction was relatively conventional, using mainly aluminium but with titanium alloy where necessary in the engine bay. The two Rolls-Royce Turboméca Adour turbofans were fed by fixed-geometry intakes on the fuselage sides, behind the cockpit. Splitter plates were initially fitted, to control the boundary layer airflow along the fuselage sides, but these were deleted on production aircraft. Two spring-loaded supplementary intake doors were mounted on the sides of the intake ducts.

The undercarriage, produced by Messier-Hispano, was designed — but rarely, if ever, used — for rough-field operation and featured low-pressure Dunlop tyres. The nose leg had a single wheel, while the main gear had twin wheels and retracted into the lower fuselage. An arrester hook was fitted to the rear fuselage, intended primarily for emergency use. An Irvin brake parachute of 5.5m diameter was stowed in the rear fuselage. Airbrakes were situated under the rear fuselage; to begin with, these had a solid outer surface, but later they were made perforated.

The shoulder-mounted wing had 3° of anhedral and 40° of sweepback on the leading edge. On the trailing edge were full-span flaps with no ailerons; spoilers were fitted to the upper surface of each wing, ahead of the outboard flaps. The all-moving tailplane had 10° of anhedral and 40° of sweepback on the leading edge. Its two halves moved differentially in conjunction with the spoilers to provide roll control.

Six internal fuel tanks comprised four in the fuselage and one in each wing, while the centreline pylon and



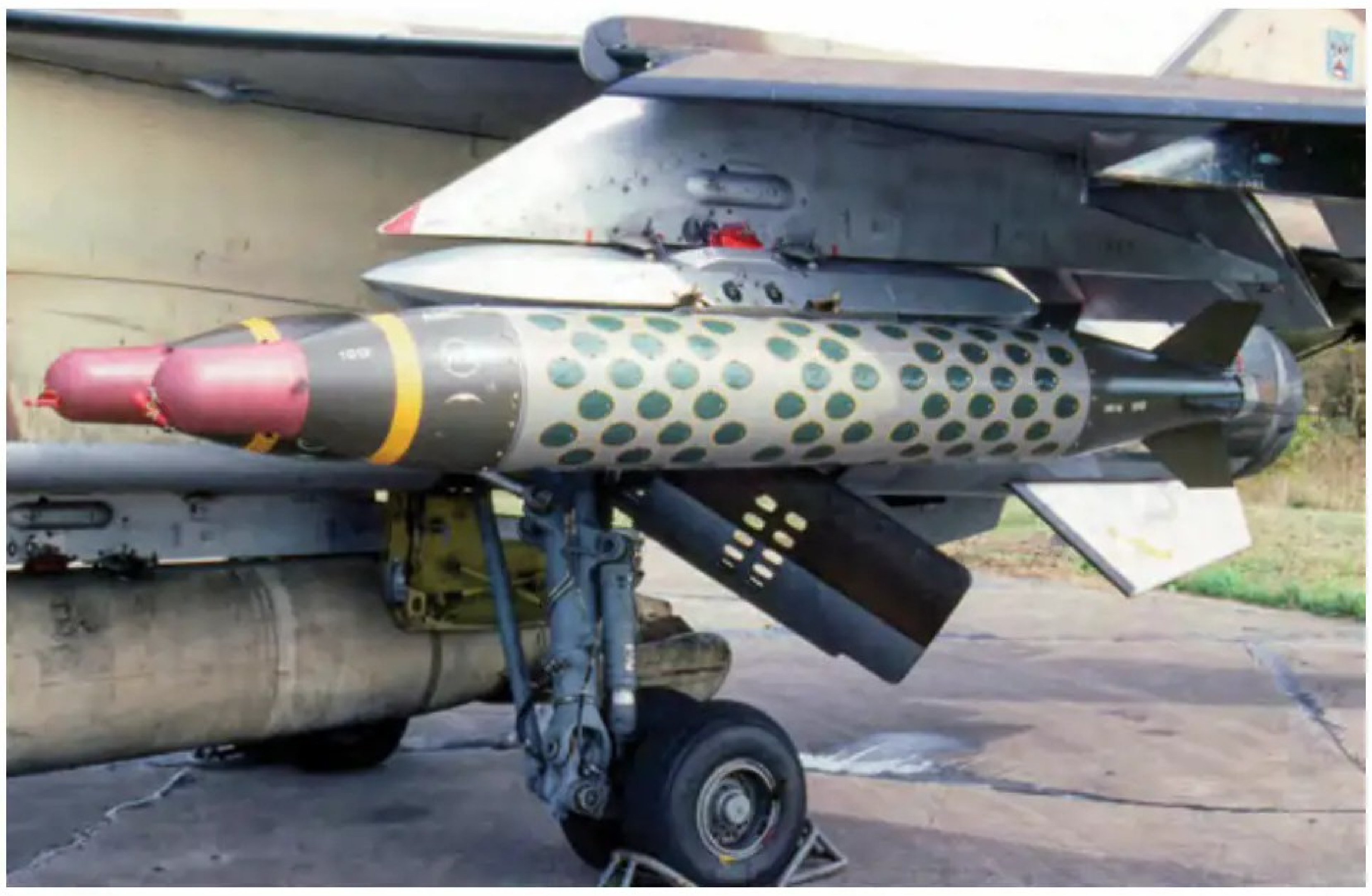
The second Jaguar built to RAF requirements, S07 (serial XW563), on display with four 1,170lb retarded bombs, two Matra 155 rocket launchers each containing 18 SNEB rockets and a 1,200-litre fuel tank hung underneath. This was close to a maximum load for the type at the time. BAE SYSTEMS

the two inboard pylons could take a 1,200-litre drop tank. A retractable in-flight refuelling probe was mounted on the starboard forward fuselage side. The design of the fuselage was such that the structure behind the cockpit, ahead of the air intakes, was common to both two-seat and single-seat variants. The Martin-Baker Mk9 ejection seat had a zero-zero capability.

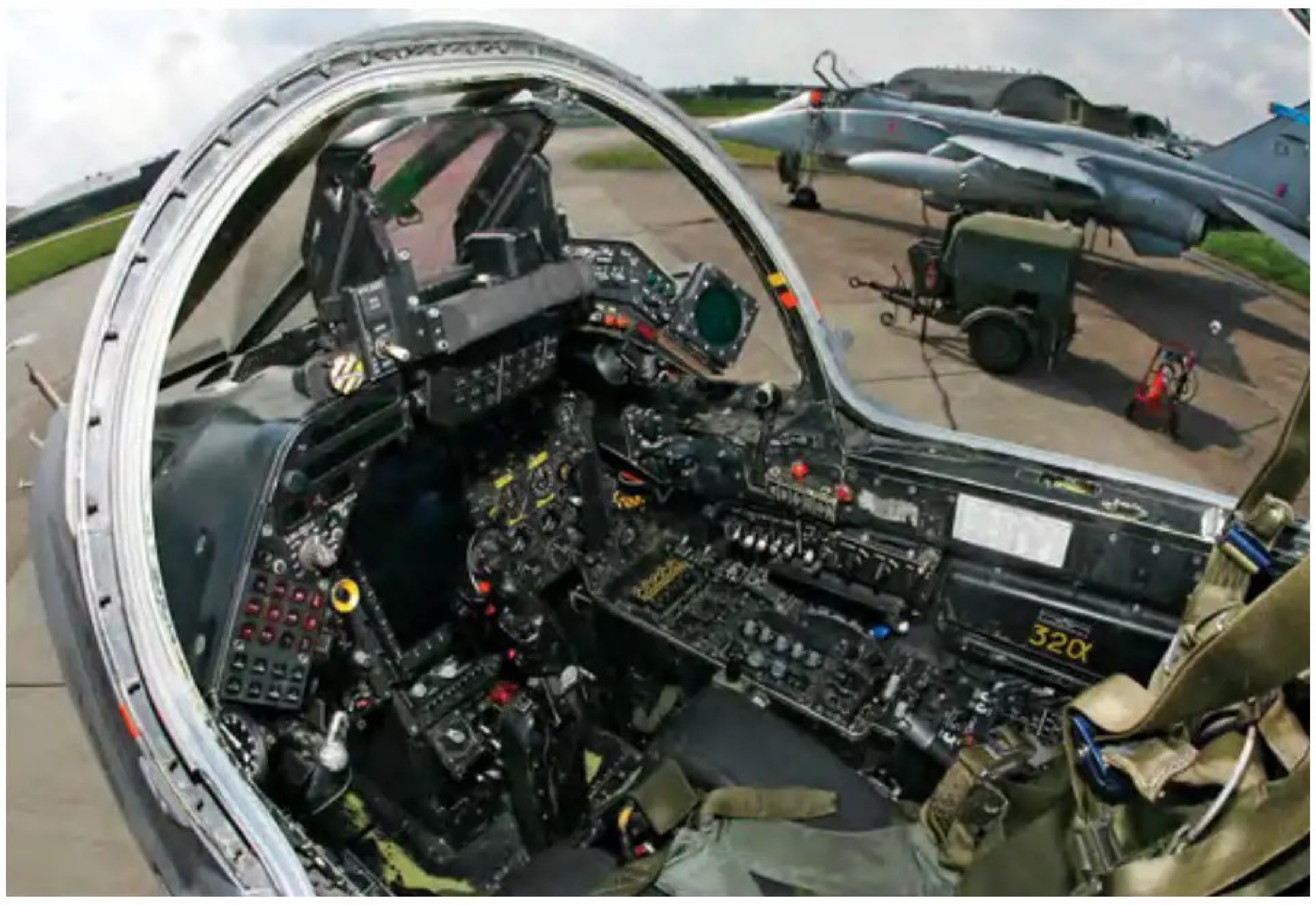
While the RAF's Jaguar GR1 and the Armée de l'Air's Jaguar A were broadly similar in design, there were elements of national equipment in each. The armament loads carried similarly reflected national differences. In 2025, the Jaguar continues to fly only with the Indian Air Force, and its aircraft to the latest DARIN III standard represent the most capable versions yet seen.

SPECIFICATIONS: JAGUAR GR1

POWERPLANTS	
Two Rolls-Royce/Turboméca Adour Mk102 turbofans, 2,418kg (5,115lb) dry thrust, 3,655kg (7,300lb) in afterburner	
DIMENSIONS	
Span: Length: Height: Wing area:	8.69m (28ft 6in) 16.83m (55ft 2in) over nose probe, 17.53m (57ft 6in) excluding probe 4.89m (16ft 0in) 24 sq m (258 sq ft)
PERFORMANCE	
Maximum speed at sea level: Service ceiling: Combat radius (hi-lo-hi):	Mach 1.1 (729kt) 45,930ft (14,000m) 820km (510 miles) on internal fuel only
WEIGHTS	
Empty: Max take-off:	7,000kg (15,430lb) 15,500kg (34,170lb)
ARMAMENT	
Internal: Two 30mm ADEN cannon, each with 150 rounds (two 30mm DEFA 553 cannon in Jaguar A) External: Four underwing pylons, one centreline pylon; later, two overwing pylons for AAMs	

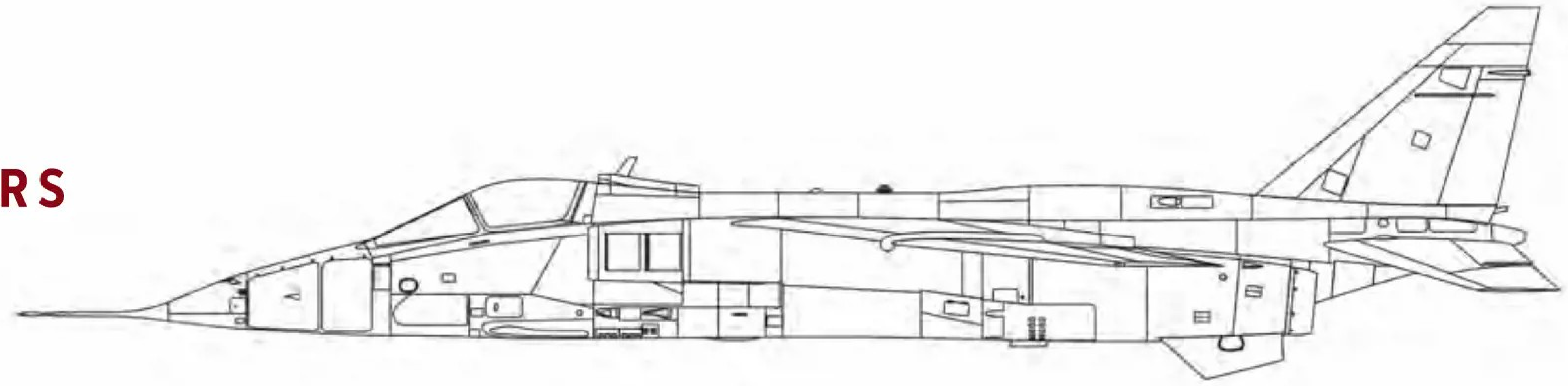


The sturdy undercarriage and perforated airbrakes illustrated by a French Jaguar A, carrying BLG-66 Belouga cluster bomb dispensers underwing. JEAN-PATRICK PLANCHAIS COLLECTION VIA PIERRE-ALAIN ANTOINE

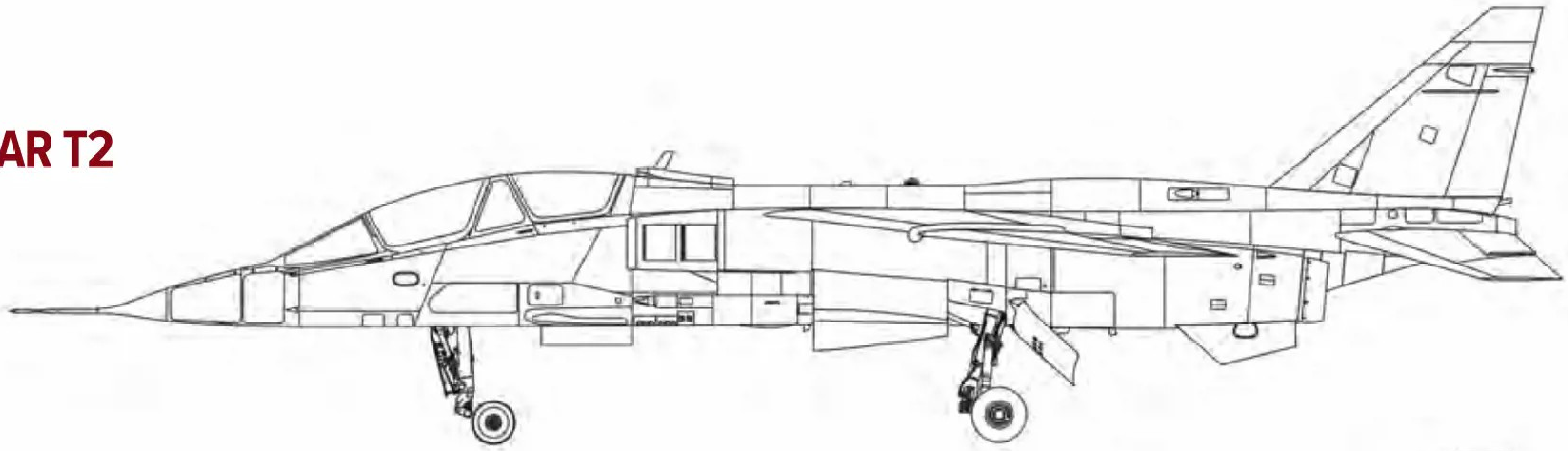


The Jaguar 97 upgrade which resulted in the GR3A featured significant changes to the cockpit displays. KEY/DUNCAN CUBITT

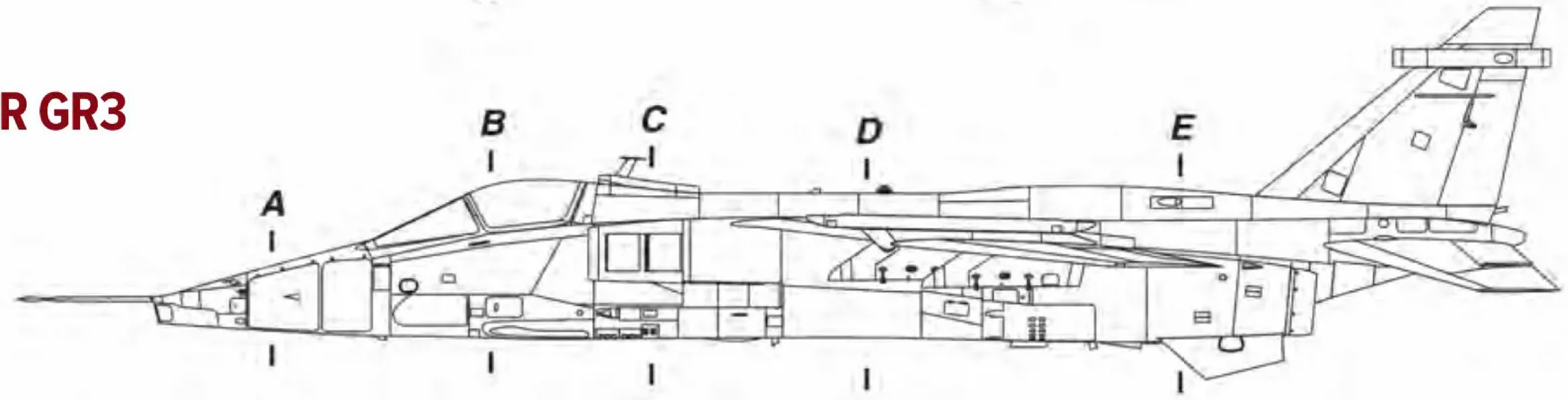
JAGUAR S



JAGUAR T2

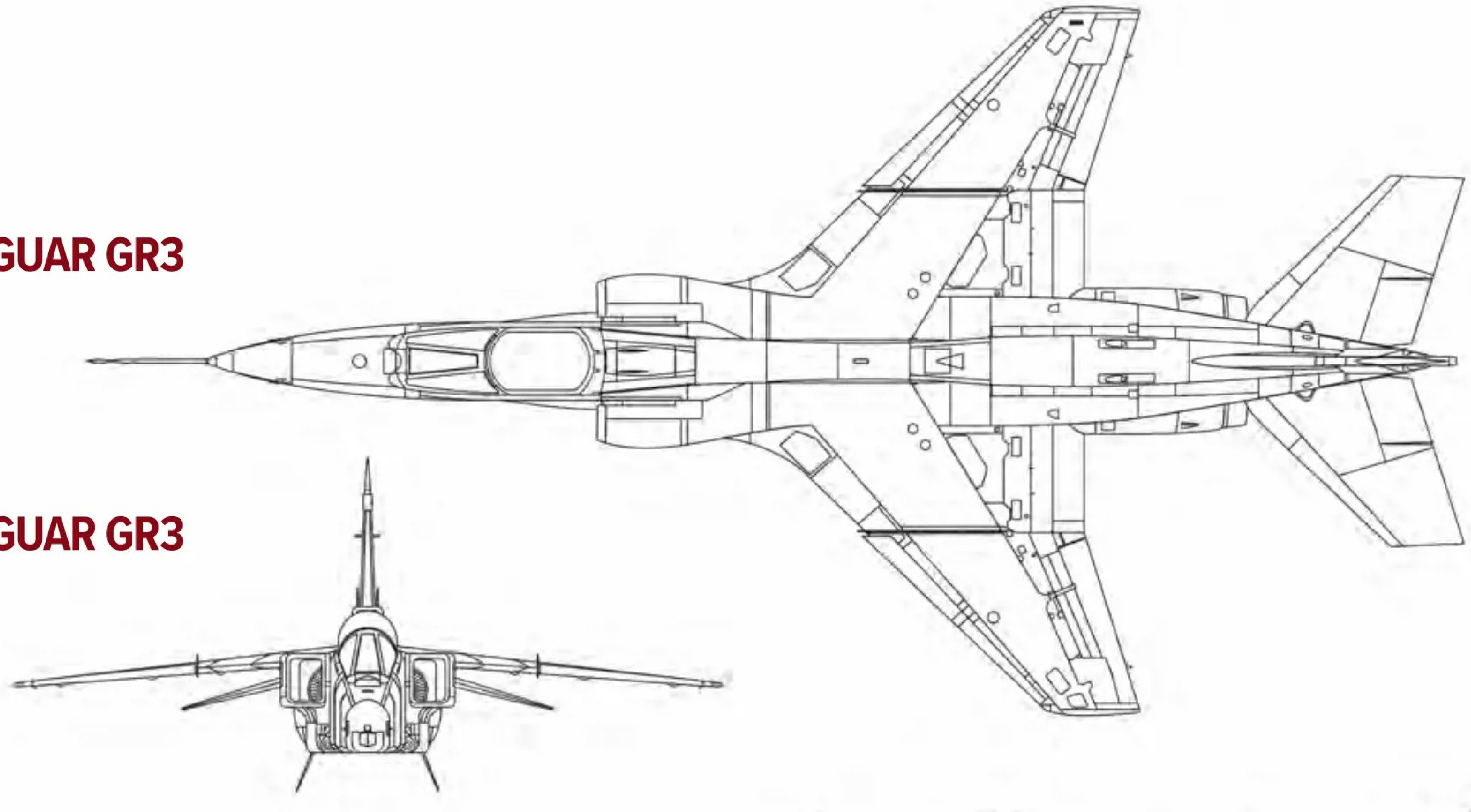


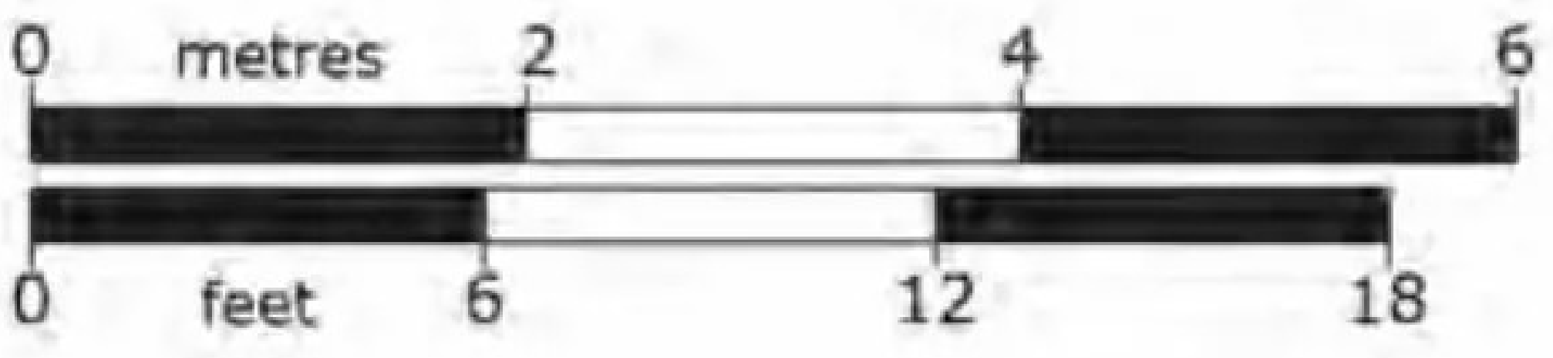
JAGUAR GR3



JAGUAR GR3

JAGUAR GR3

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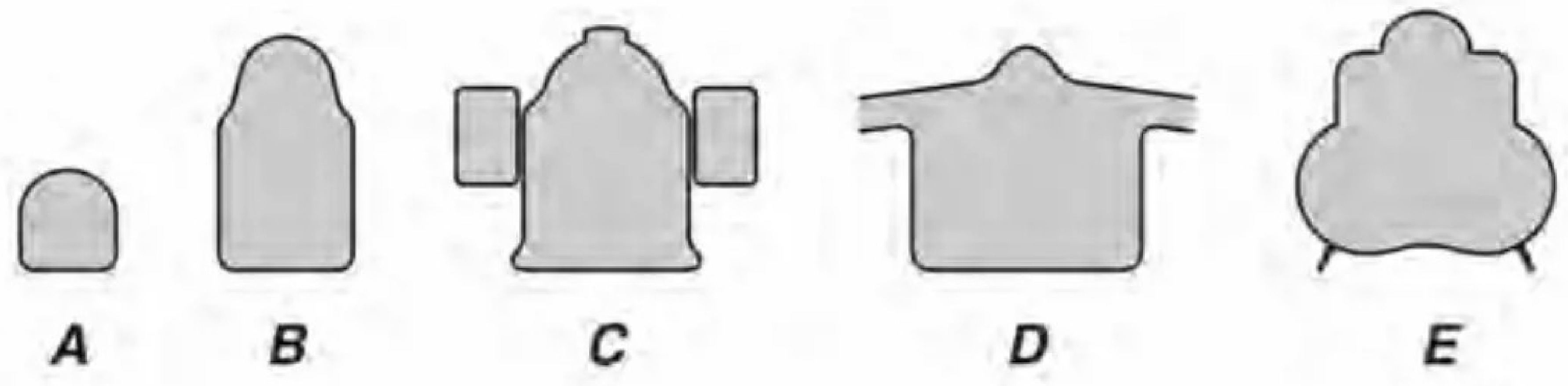


Underrated by many, the Jaguar would more than prove its worth in war

Aircraft from the last four RAF Jaguar squadrons stacked up in 2002: from the top, Nos 41, 54, 6 and 16(R) Squadrons, the latter being the year's display jet. CROWN COPYRIGHT

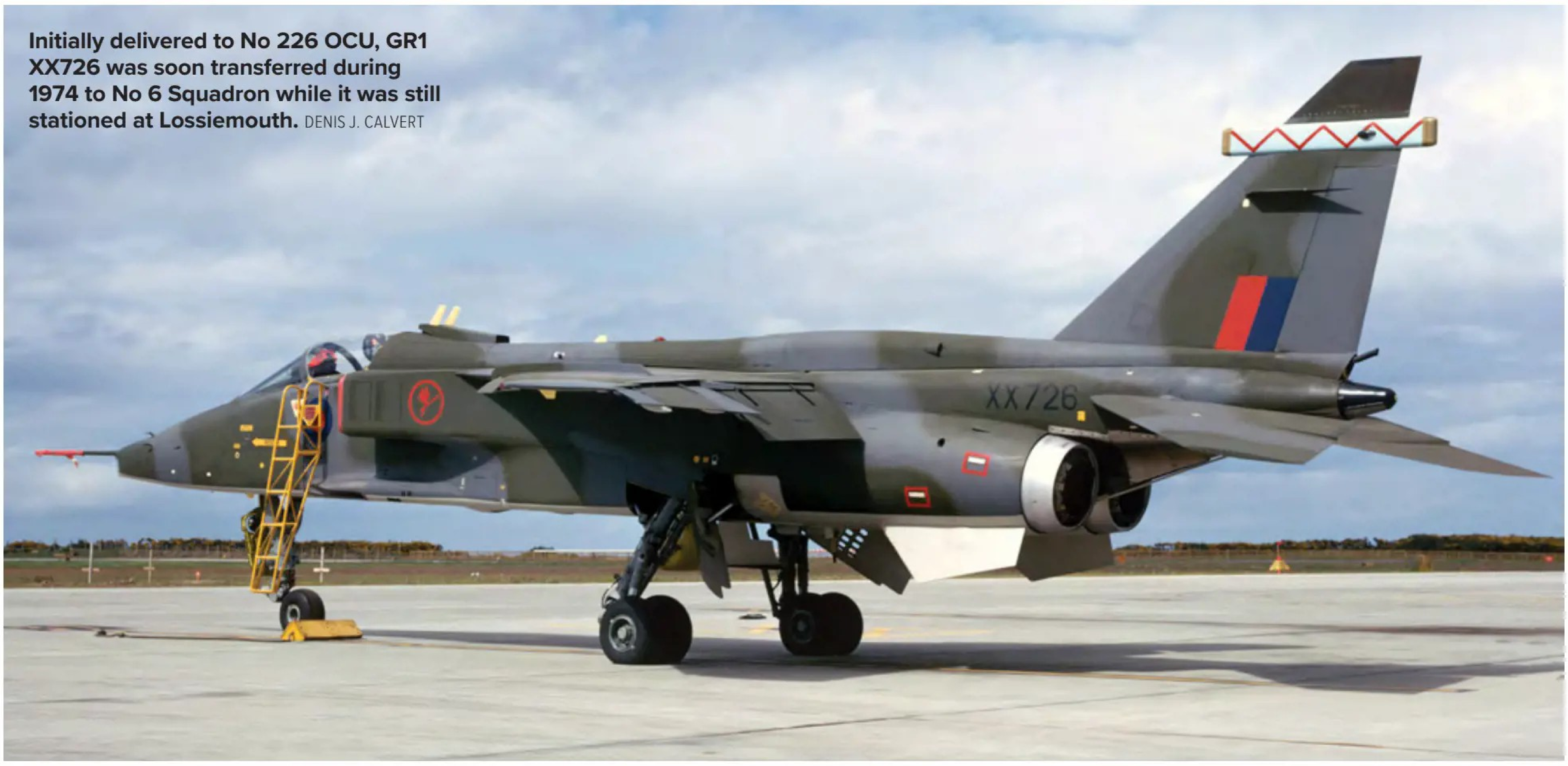
RAF in the Cold War

As befits the introduction of a new aircraft type into RAF service, the first British recipient of the Jaguar was the operational conversion unit, in this case No 226 OCU at Lossiemouth. Early British single-seat production Jaguars S4, S7 and S8 were delivered to the Jaguar Conversion Team at Lossiemouth from May 1973, with BAC test pilots running the course for the first RAF pilots. On 1 October 1974, the conversion team was redesignated as No 226 OCU and training continued on an expanded scale to prepare for the planned eight RAF front-line squadrons.

The first of those to form was No 54(F) Squadron on 29 March 1974. Initially based at Lossiemouth, it moved to Coltishall in August of the same year, an airfield which would eventually house all three UK-based Jaguar squadrons and become the spiritual home of the type. No 6 Squadron would follow; formed at Lossiemouth on 1 October 1974, it joined 54(F) at Coltishall the following month. One of 6's initial deliveries was GR1 XX726, recognisable as the first aircraft to full production standard with the 'chisel nose' incorporating the LRMTS. In the northern European theatre, the Jaguar's primary role in daytime operations involved penetrating enemy defences at high speed and ultra low-level to deliver conventional weapons, including free-fall 1,000lb GP bombs, retarded 1,000lb bombs, and BL755 cluster bombs.

> *"The Jaguar had a smooth ride and exceptional range at low level"*

The build-up of the Jaguar force in RAF Germany involved an intensive work-up period before the first example, T2 XX836, arrived at Brüggen on 7 April 1975. At the time, Brüggen was home to three squadrons of



Initially delivered to No 226 OCU, GR1 XX726 was soon transferred during 1974 to No 6 Squadron while it was still stationed at Lossiemouth. DENIS J. CALVERT

Phantom FGR2s; these were to be replaced by four squadrons of Jaguars. While at first sight this was a strange move, the Jaguar having neither the raw power nor the weapons load of the Phantom, it had the great advantage of fuel economy from its relatively low-powered Adour turbofans. This, allied to good internal fuel tankage and the design of the wing, gave the Jaguar a smooth ride and exceptional range at low level.

The author recalls visiting Brüggen during the work-up and discussing the transition from Phantom to Jaguar with one of the squadron bosses. He was unstinting in his praise for the new aircraft: "Our job is to take a single nuclear weapon into eastern Europe. The Jaguar allows us to take it twice as far as did the Phantom". That weapon was the WE177A.

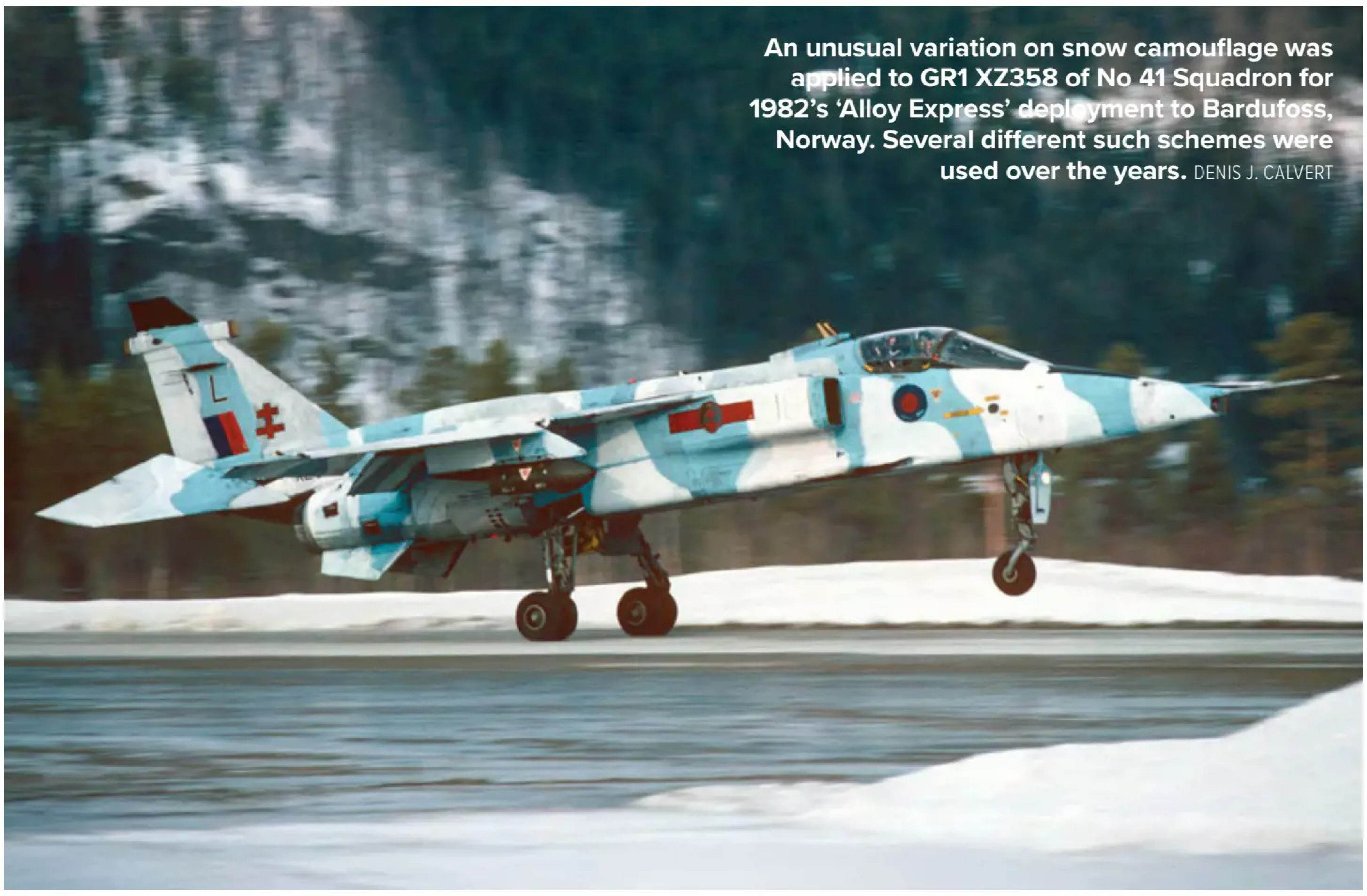
First to receive the Jaguar in RAFG was No 14 (Designate) Squadron, which received a total of 12 aircraft over the summer of 1975 and dropped the 'designate' on 1 December of that year. It was joined at Brüggen in 1975 by No 17 Squadron and during 1976 by No 31 Squadron, all three having previously operated the Phantom in the strike/attack role. The fourth Brüggen Jaguar unit was No 20 Squadron, which re-formed on 1 March 1977. This completed the re-equipment of the Brüggen wing; four squadrons, each initially of 12 aircraft but increasing later to 16.

At the time of the re-equipment programme, Brüggen — like the other RAFG front-line bases — was 'hardened' with the building of NATO-standard hardened aircraft shelters, the hardening of other essential buildings including the operations block and a general 'toning-down' of the base. Each HAS, designed for the operation of a single aircraft, could accommodate two Jaguars thanks to the type's small footprint.

Two further Jaguar squadrons were formed, both with a primary reconnaissance role. For this, an unfeasibly large (5.8m in length and weighing 560kg) reconnaissance pod was fitted on the centreline station. Built by BAC at Weybridge, it mounted alternative fits of wet-film cameras appropriate to either low- or medium-level photography and an infra-red line-scan in the rear portion. In RAFG, No II(AC) Squadron re-formed with Jaguars in the reconnaissance role on 1 October 1976 to be based at Laarbruch, while in the UK No 41(F) Squadron did likewise in the same role at Coltishall on 1 April 1977. These two squadron formations completed the RAF's Jaguar re-equipment programme; five squadrons were now operational on two RAFG bases and three squadrons in the UK at Coltishall. The Jaguar did not have a true all-weather or night capability, but what it did it did exceptionally well, and by 1980 it was the RAF's most numerous front-line aircraft type.

The UK-based squadrons had a NATO reinforcement role in support of the Allied Command Europe Mobile Force, frequently deploying in the winter months to Norway for arctic exercises. RAF pilots involved soon got used to the intricacies of the 'downhill' approach pattern at Bardufoss, operating from icy ramps and runways and flying at low level over terrain covered with snow, which made difficult the recognition of landmarks. While Nos 6 and 54(F) Squadrons were tasked with ground attack, 41(F) had

No II(AC) Squadron GR1 XZ111 on a training sortie over West Germany. BAE SYSTEMS



An unusual variation on snow camouflage was applied to GR1 XZ358 of No 41 Squadron for 1982's 'Alloy Express' deployment to Bardufoss, Norway. Several different such schemes were used over the years. DENIS J. CALVERT

a dual role, albeit one where ground attack was secondary to reconnaissance. Thus, Coltishall's three squadrons became the RAF's choice for deployment at short notice, having honed this ability over years of exercises. This demonstrated capability would be important when the RAF found the need to deploy forces to the Gulf in Operation 'Granby', following Iraq's invasion of Kuwait on 2 August 1990.

RAFG's Jaguar squadrons had only a comparatively short time with the type before re-equipping with the more capable Tornado GR1 from mid-1984. All four Brüggen units had completed this process by the end of 1985, although No 2 Squadron at Laarbruch held on until December 1988. This left Coltishall as the sole remaining front-line Jaguar base. No 226 OCU stayed for some years at Lossiemouth, being redesignated as No 16(R) Squadron on 1 November 1991 and finally moving to Coltishall in July 2000.

RAF in the Gulf War — and after

After the Iraqi invasion of Kuwait, the RAF deployed Tornado F3s to the Gulf to provide air defence, but for close air support it had the choice between the Tornado GR1, Harrier GR5 and Jaguar. In the event, the Tornado force was less ready for immediate deployment, while the Harrier GR5 was still awaiting clearance for some of its weaponry. So it was that the Jaguar force at Coltishall, at a high readiness state with fly-away packs of spares and items ready for use, was selected.

The boss of No 6 Squadron, Wg Cdr Jerry Connolly, was named detachment commander and was tasked with selecting a batch of available and suitably experienced pilots to deploy to Thumrait in Oman. Twelve Jaguars were painted in 'desert pink' camouflage on the night of 10-11 August 1990 before leaving Coltishall on 11 August, staging via Akrotiri and reaching Thumrait on the 13th. By the following day, four were on alert, armed with BL755s and 30mm ADEN cannon.

The Jaguars' primary role in the Gulf was air interdiction, but also anti-surface unit warfare and reconnaissance and, soon after their arrival in the Gulf, intensive flying training commenced. Thumrait, being close on 1,000 miles from Kuwait, was not an ideal base for the Jaguar Detachment, or 'JagDet' as it became known. A move to Muharraq, Bahrain was agreed and the required logistical effort got under way in early October 1990 with the assistance of US Air Force C-130 transports.

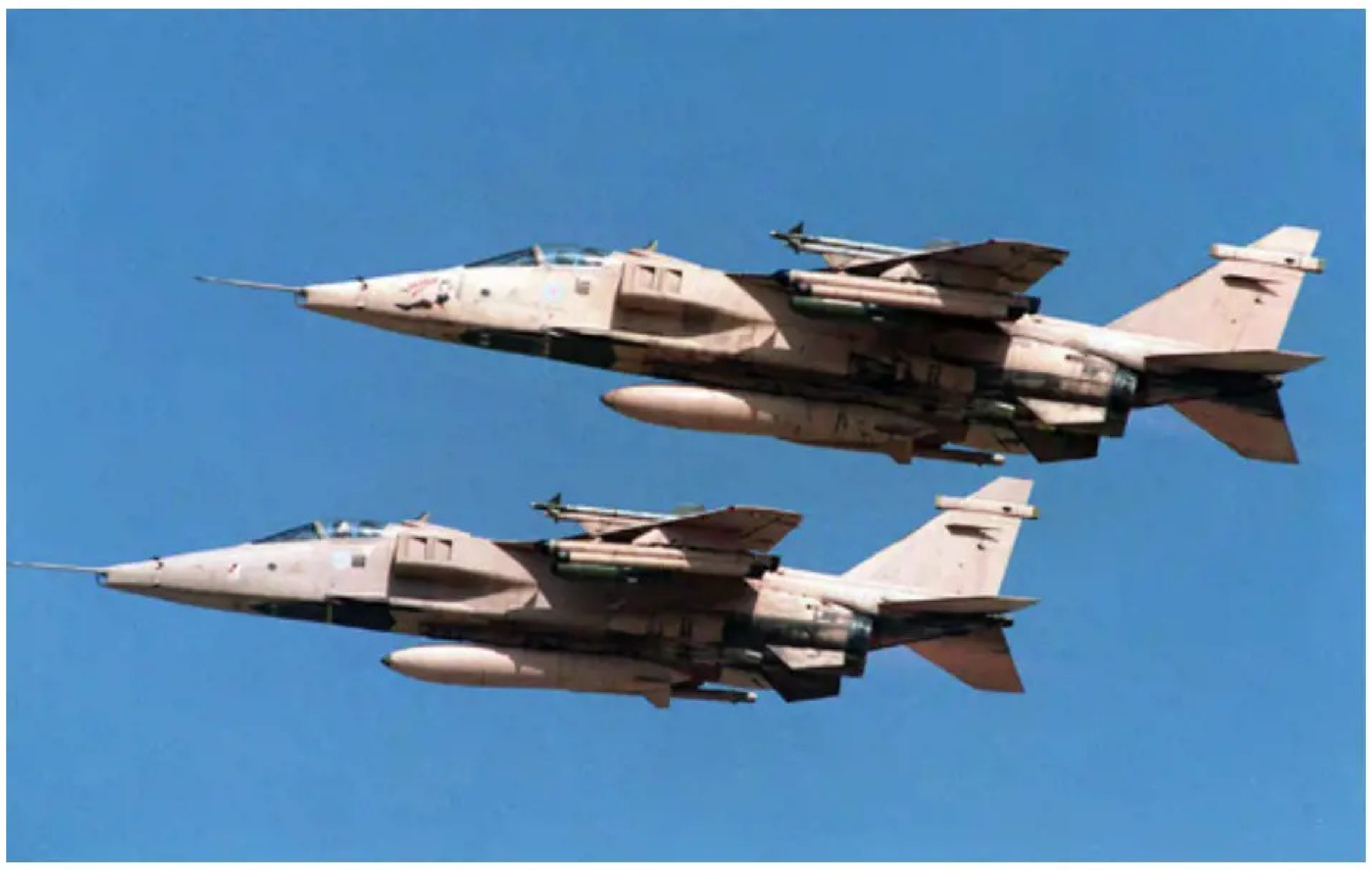
Training sorties resumed from 10 October, the King Fahd range being used for bombing and strafing attacks. 13 November saw the only JagDet fatality, when Flt Lt Keith Collister in XX754 flew into a desert ridge. The initial batch of Jaguars in theatre was replaced in late October/early November by Stage 2 aircraft with enhancements including the Sky Guardian RWR and compatibility with night vision goggles. At the same time, a change-over of pilots and ground crew was made, while a new detachment commander, Wg

DATAFILE

'JAG KILLER'

The Jaguar had a decent if far from spotless safety record in RAF service, but with no combat losses recorded. Perhaps the strangest loss was that of a No 14 Squadron GR1, which was shot down by an AIM-9G Sidewinder fired from RAF Phantom XV422. This happened on 25 May 1982, when Flt Lt Steve Griggs in XX963, along with a second Jaguar of No 14 Squadron, was returning to his home base of Brüggen at the completion of a training sortie. Unbeknown to him, a pair of air defence Phantom FGR2s had been launched from Wildenrath for a training exercise. The fighter controller then vectored the Phantoms onto the Jaguar pair. Nothing unusual there — RAF Phantoms frequently intercepted targets of opportunity, setting up a stern attack and, when within range, the pilot pressing the missile release trigger. What was different this time was that the Sidewinders carried were not acquisition (dummy) rounds, and despite the Phantom's crew having correctly pulled the appropriate circuit-breaker in the rear cockpit to ensure everything was safe, a missile streaked off the rail. It found its target, impacting the Jaguar on the tail and rendering it totally unflyable, this to the great surprise of the Phantom crew. Yet more concerned was Griggs in the Jaguar, who had no idea what had happened but found his aircraft yawing violently. He took the decision to eject and make a Martin-Baker let-down. This part of the flight went according to plan, and he landed safely in a field, only to note an RAF Phantom making a pass overhead. But why? Unbeknown to Griggs, this was the aircraft that had shot him down.

As is so often the case, no one factor caused this unfortunate incident, the facts being presented at a board of enquiry. Despite strict procedures being in place to prevent just such a happening, events had conspired to render such precautions ineffective. Subsequently, Phantom XV422/J was marked with the silhouette of a Jaguar and the name 'Jag Killer'. An example, perhaps, of RAF dark humour, but also to remember an event officialdom would surely rather forget.



Airborne out of Muharraq on a 'Desert Storm' sortie are GR1As XZ367 *Debbie* and XX962, both sporting mission symbols as well as their *Viz*-inspired nose art. ALAMY

Cdr William Pixton, OC No 41(F) Squadron, took over.

New weapons were cleared for use in the Gulf. Replacing the outdated and inaccurate SNEB rocket was the CRV-7, which was issued to the RAF in October 1990 and cleared for use on 14 January 1991. The BL755 cluster bomb was a standard weapon on the RAF Jaguar fleet but was intended for low-level delivery. In the Gulf, Iraqi AAA and SAM air defences posed a serious threat, and JagDet made an eve-of-battle switch to ingressing and attacking from medium level.

William Pixton explains the reasoning: "The decision whether to fly at low or medium altitude was specifically mine to make and I went somewhat against the tide, especially considering that my Tornado counterparts were maintaining their low-level approach. Before deciding, I consulted with the USAF 'Wild Weasel' squadron commander and the US Navy F/A-18 squadron commander — a Vietnam war veteran — who, conveniently, were also based on Bahrain island. They were both adamant that medium-level was the way to go. The 'Wild Weasel' CO was confident in his squadron's ability to suppress the enemy's SAM and AAA, and the F/A-18 CO recounted horror stories about his low-altitude attacks during the Vietnam war."

A suitable replacement cluster bomb was found in the American CBU-87, which could be dropped from any altitude to release its bomblets at a pre-set height, thus ensuring a close pattern. AIM-9L Sidewinders were progressively fitted to JagDet aircraft on newly produced overwing pylons, and the first four Jaguars so equipped left Coltishall for the Gulf on 12 November. At last, the Jaguar had realistic self-defence even if, as things turned out, there would be no serious air-to-air threat in the Gulf.

The first live use of CRV-7s was against Iraqi fast patrol boats on 29 January 1991 by Flt Lt Mark Hopkins and Flt Lt Alex Emtage, but the weapon was also used against ground targets. In all, 608 CRV-7 rockets were fired during 'Granby'; while early results showed disappointing accuracy, changes to the weapon-aiming software improved things significantly. With supplies assured by the USA, the CBU-87 became JagDet's standard weapon, its only disadvantage being that a Jaguar could only carry one on each inner pylon, rather than two BL755s on the tandem beam.

Nos 6, 41 and 54 Squadrons are all represented in this February 1994 view of the Coltishall Jaguar flightline. BOB ARCHER

For reconnaissance missions, two LOROP (Long-Range Oblique Photography) pods were obtained on loan from Vinten. These used wet film and had a 36in lens which made possible medium-level photography in great detail. However, unlike the standard BAC reconnaissance pod, which was fed positional information by the FIN 1064, LOROP had no interface with the Jaguar's nav/attack system. Pilots likened trying to aim LOROP's camera to "looking through a straw", while the photographic interpreters were given no information as to the co-ordinates of any image it supplied. As a result, JagDet started flying a 'recce pair': one aircraft with LOROP and the other, flying closely alongside, using the standard BAC pod with an F126 medium-level survey camera that took photos with a data matrix imprinted on them. This proved reasonably successful, but LOROP would have no long-term future with the RAF Jaguar fleet.

JagDet's deployment to the Gulf, work-up and combat operations over the six weeks of the 'live' war must be considered most successful. The Jaguar proved serviceable in difficult conditions, the crews adapted well to medium-level operations rather than the low-level role with which they were more familiar, upgrades to the aircraft and its armament were achieved in record time, and no aircraft or pilot was lost in combat during 618 sorties. Although planning for the Jaguar squadrons in war envisaged deployment to Europe's northern or southern flanks, that to Thumrait, then Muharraq was in every sense out-of-area. Nevertheless, the logistical chain proved able to cope over a much greater distance to bases in an unfamiliar host nation. With the Iraqis having been ejected from Kuwait, 28 February brought a ceasefire and JagDet's

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'JagDet' aircraft share the Thumrait ramp with F-15E Strike Eagles of the US Air Force's 4th Fighter Wing during the 'Desert Shield' Gulf build-up. USAF

ABOVE: One of the final flights by QinetiQ-operated T2A XX833 took it through the Mach Loop. CHRIS PROCTER/AIRTEAMIMAGES.COM
ABOVE RIGHT: The famed 'Spotty Jag', No 6 Squadron GR3A XX119, so painted in 2007 to mark the type's RAF retirement. CROWN COPYRIGHT

aircraft returned to the UK in early March, a ceremonial homecoming being held at Coltishall on the 13th.

While the French Jaguars had a relatively short life in front-line AdlA service, the RAF continued to spend money and update its fleet to maintain its effectiveness into the 21st century, its service life extended to cover for the late-running Eurofighter Typhoon — once promoted as Eurofighter 2000. The three Jaguar squadrons at Coltishall saw a rolling programme of upgrades and enhancements through the 1990s, some being the formal adoption of improvements introduced during the Gulf War.

A 'long-term fleet' of airframes was identified to take the type through to its out-of-service date, which was then seen as 2009. This fleet, whose aircraft were modified to incorporate all changes in the Jaguar 96 and Jaguar 97 standards, would then be at a common configuration, TIALD-compatible and progressively fitted with Adour 106s, rebuilt from Mk104s. The requirement was for a pool of 47 Jaguars to provide the strength of the three front-line squadrons at Coltishall and for the OCU; 40 single-seat GR3As and seven T4s, the latter mainly for OCU use. It was around this time RAF Jaguars adopted a new overall grey paint scheme, replacing the original dark grey/green upper-surface camouflage that was more applicable to low-level flying.

Shortly after the end of the Gulf conflict, RAF Jaguars again deployed abroad, this time as part of a coalition effort to police a 'no-fly zone' above the 36th parallel in Iraq and protect Kurdish refugees from Iraqi interference. For this, the Jaguar detachment was based at Incirlik, Turkey. This was a considerable distance from Iraq, meaning missions were typically long and involved one or more in-flight refuellings.

When that commitment was handed over to the Harrier force, growing tensions in the Balkans led in 1993 to Jaguars deploying from Coltishall to Gioia del Colle, Italy, initially to support UNPROFOR (UN Protection Force) troops in Bosnia against Serbian aggression. Participation in November 1994's raid on Udbina airfield — which had been used by Serbian Air Force Soko J-22 Oraos to mount an attack on Bihac, in violation of a UN 'no-fly zone' — marked the first time RAF aeroplanes had flown an operational bombing mission in Europe since World War Two.

GR1A XZ106 of No 41 Squadron in the grey scheme applied for Bosnia operations. In company with it is a No 20(R) Squadron Harrier GR7. ALAMY

For various operational and basing reasons, RAF Jaguars did not take part in the Iraq war — Operation 'Telic' to the British — in 2003, although a number of aircraft were held at readiness at Coltishall in case they were required. Jaguars did, though, continue to participate in deployments overseas.

No 6 Squadron marked its 90th anniversary on 30 January 2004. It was a proud moment for the unit, which had never — up to this point — been disbanded. But a government defence capabilities review on 21 July 2004 signalled the beginning of the end for the RAF Jaguar force. As a result, No 54(F) Squadron and 16(R), the OCU, disbanded on 11 March 2005, while 41(F) stood down as a Jaguar squadron on 1 April 2006. Coltishall itself entered a period of draw-down, closing on 31 December 2006 after 66 years. The final survivor was No 6 Squadron, which moved to Coningsby on 1 April 2006 for another year of operations before disbanding on 31 May 2007.

This was not quite the end of Jaguar flying in the UK. XX833, a T2A used by QinetiQ at Boscombe Down, had the honour of making the final flight on 20 December 2007. It was later taken by road to RAF Cosford, where it met up with many other non-airworthy — but taxiable — Jaguars used for engineering instruction with what is now part of the Defence College of Technical Training.

France

The first production Jaguar, serial E1, took to the skies on 2 November 1971. In all, the Armée de l'Air would receive 160 single-seaters (A1-A160) and 40 two-seaters (E1-E40). After pilots and mechanics had received training on the new type with the Centre d'Expertise Aérienne Militaire, or CEAM, at Mont-de-Marsan in early 1973, Escadron de Chasse 1/7 'Provence' became the first to re-equip with the Jaguar. Stationed at Base Aérienne (BA) 113 Saint-Dizier, its initial aircraft were delivered on 24 May 1973.

Ten operational units went on to be equipped with the Jaguar. The 7ème Escadre de Chasse (fighter wing) comprised four Escadrons de Chasse (fighter squadrons): EC 1/7 'Provence', 2/7 'Argonne', 3/7 'Languedoc' and 4/7 'Limousin'. Three of its squadrons were based at Saint-Dizier, where the wing was headquartered, 1/7 and 3/7 being assigned the tactical nuclear mission with the AN-52 bomb while EC 2/7 was the OCU. EC 4/7, which also had a nuclear strike mission, was stationed at BA125 Istres.

The 11ème Escadre de Chasse, which previously operated the F-100 Super Sabre, started its Jaguar conversion from October 1975. It also included four squadrons: EC 1/11 'Roussillon', 2/11 'Vosges', 3/11 'Corse' and 4/11 'Jura'. Of these, three were located at BA136 Toul-Rosières, with the fourth, 4/11, at BA106 Bordeaux-Mérignac. The mission of the wing was conventional attack. However, in addition to this, EC 2/11 'Vosges' — which I had the honour of commanding — had offensive electronic warfare as its main role, as well as anti-radar with the Franco-British AS-37 Martel missile.

EC 3/3 'Ardennes', at BA133 Nancy-Ochey, was part of a wing whose other two squadrons flew Mirage IIIEs and whose primary mission was defence suppression/anti-radar. The fact that the Mirage IIIE was not refuellable in flight is the reason this task, in the context of external operations, was carried out by the Jaguar.

TOP: 'Clean' except for the AS-37 anti-radar missile, Jaguar A46 from EC 3/7 dumps fuel. VIA PIERRE-ALAIN ANTOINE

MIDDLE: Jaguar A92 of EC 3/11 at low level over the Chadian desert. VIA PIERRE-ALAIN ANTOINE

ABOVE: A pair of EC 1/11 Jaguar As, A97 and A101, up from Al Ahsa on a 'Desert Storm' — Opération 'Daguet' to the French — mission. The majority of the AdlA Jaguars sent to the Gulf were from EC 11. ARMÉE DE L'AIR

From summer 1988 to July 2001, the Centre d'Instruction Tactique at BA116 Luxeuil was equipped with five Jaguar Es to undertake the training of navigators destined to fly the Mirage 2000N with the co-located 4ème Escadre de Chasse.

The Jaguar was to be France's aircraft of choice for external operations. On 19 November 1977, the 11ème Escadre deployed four Jaguar As and four Es to BA160 in Dakar as part of Opération 'Lamantin', in response to the conflict between Mauritania and the Polisario Front following the signing of defence agreements between France and Mauritania. This was followed by the 'Tacaud' mission in Chad in February 1978. Then came Opération 'Epervier' (Sparrowhawk) from 1983-90, part of a defence accord between France and Chad to protect the latter against a Libyan invasion. As many as 24 Jaguars were stationed at bases in Dakar (Senegal), Libreville (Gabon), Bangui (Central African Republic) and N'Djamena (Chad).

Following on from the Ati and Djedda battles in Chad in May 1978, 11 Jaguars from EC 1/11 intervened on 16 February 1986 to destroy the Libyan airstrip at Ouadi-Doum in northern Chad. And on 6 January 1987, aircraft of EC 3/3 knocked out the 'Flat Face' early warning radar at the same Libyan base, using an anti-radar Martel missile.

The Jaguars left Africa in September 1990 as part of the build-up to what became the Gulf War, flying from Al Ahsa in Saudi Arabia. On 17 January 1991, 12 jets from EC 2/11 carried out the first French attack mission of the conflict on Al Jaber airfield in Kuwait. Four aircraft were hit in the course of the sortie, but all landed safely in Saudi Arabia. AdlA Jaguars returned to Africa from 1992-95, and were also deployed over Kosovo from Italy.

It is noteworthy that Jaguar A91 took part in the battles of Jeddah, Ouadi-Doum and Al Jaber. Each time it was seriously damaged by hostile fire but always brought its pilot to safety. Returned to France in a Transall C-160, it is now on display in the Concorde hall at the Musée de l'Air et de l'Espace at Le Bourget, a fitting symbol of the Jaguar's overseas operations and its solidity.

In France, the Jaguar was withdrawn from service on 1 July 2005, EC 1/7 having the distinction of being the first and the last squadron to be equipped with the type. It subsequently became the first to re-equip with the Rafale.

Pierre-Alain Antoine

No 6 Squadron at AFS Jamnagar is the operator of these Jaguar IS single-seaters, among the considerable Indian fleet still in service. INDRANIL NANDI VIA VIKRAM SINGH

India

Even before the 1971 war with Pakistan, the Indian Air Force had started looking for a suitable third-generation strike fighter to replace its ageing Hunters, Canberras and Mystères. The IAF chief had flown in an F-4 Phantom, been shown the F-111 in the USA and visited the AMD-BA factory to see the Jaguar, Mirage III and Mirage F1 in July 1971. In 1972, one IAF team evaluated the Jaguar, Mirage III and F1C, Hawker Siddeley Buccaneer and Saab Viggen, while another examined the Sukhoi Su-17/22 at Kubinka. The Jaguar was finally selected as the winner of the Deep Penetration Strike Aircraft competition, and in October 1978 a programme was approved for the acquisition of 150.

Accordingly, the Indian government concluded two agreements in April 1979, the first for the outright purchase of 40 Jaguars in fly-away condition serialled JS101-JS135 and JT051-JT055, all with India-specific Adour 804 engines. A second agreement covered the licence-manufacture in India of a further 110. Of these, 45 were to be built from imported components and the remaining 65 manufactured with an increasing proportion of indigenous components and raw materials including the newer, uprated Adour 811.

But with the sudden and unexpected appearance of corrosion on IAF Canberra undercarriage oleo legs, the Indian government authorised the early acceptance of 16 ex-RAF Jaguar GR1s and two T2s as interim aircraft on loan, all serialled in the IS series. Twelve IAF pilots proceeded to the UK in February 1979, with eight more later, to complete conversion at No 226 OCU at Lossiemouth, followed by operational experience with No 54(F) Squadron and reconnaissance sorties with 41(F) at Coltishall.

The first pair of Jaguars, a single-seater and a two-seater, arrived in Ambala on 27 July 1979. Further deliveries from this batch I allowed No 14 Squadron ‘Fighting Bulls’ to convert from the Hunter Mk56A. With BAe new-build deliveries of batch II aircraft commencing in March 1981, No 14 Squadron re-equipped, then ferried the ex-RAF examples back to Warton, while No 5 Squadron ‘Tuskers’ converted from the Canberra B(I)58, also at Ambala. The IAF decided to give Indian names to foreign-supplied aircraft and the Jaguar became the Shamsher, an Indian curved sword, but the moniker did not stick and was rarely used.

The initial NAVWASS did not meet IAF requirements, so a locally integrated avionics upgrade suite called the DARIN I (Display Attack and Ranging Inertial Navigation) nav/attack system was developed by the Defence Research and Development Organisation (DRDO) and Hindustan Aeronautics (HAL). This update was implemented from the fourth aircraft of batch III on 35 HAL-assembled single-seat and 10 two-seat Jaguars, with serials JS140 upwards. It allowed No 27 Squadron ‘Flaming Arrows’ on Hunters and No 16 Squadron ‘Black Cobras’ to convert from June 1985 at Gorakhpur. Ultimately, HAL would assemble/build 91 Jaguars: 70 DARIN I fighters (JS136-JS205), 11 maritime DARIN I aircraft (JM252-JM258 and JM259-JM262) and 10 DARIN I trainers (JT056-JT065).

Along with the DARIN upgrade, a Jaguar IM (International Maritime) maritime attack version was developed with the Thomson-CSF Agave radar and the BAe Dynamics Sea Eagle anti-ship missile, and 11 of the Batch II HAL-assembled IM aircraft were delivered to ‘A’ Flight of No 6 Squadron ‘Dragons’ at Pune between April 1987 and April 1999. The remaining Canberra B(I)58s were exchanged for further Jaguar IS (International Strike) aircraft in late 1991. Initial Jaguars were armed with two 30mm ADEN cannon and could carry 1,000lb general-purpose bombs, Matra 155 18-tube rocket pods, two Matra R550 Magic 1s overwing, a single Sea Eagle and a LOROP reconnaissance pod.

Given the increasing threat scenario, several new capabilities were integrated by the IAF and HAL including the Tarang radar warning receiver, Matra BAP 100 runway penetration bomb, Hunting BL755 cluster bomb, Paveway II 1,000lb laser-guided bombs and Tracor AN/ALE-29 chaff and flare dispensers scabbed onto the engine bay doors. An Elta cockpit laser designation system (CLDS) was fitted in the rear cockpit of several trainers but ultimately removed to make way for the Litening designator pod which required a new, strengthened hardpoint to be attached under the port gun. Given the lack of an autopilot, initially only two-seaters were given the Litening pod, but with the later retro-fitting of a Sextant autopilot, single-seat aircraft were so modified.

During the Indian peacekeeping forces' deployment in 1990-91 against the 'Tamil Tigers' in Sri Lanka, Jaguars were employed in the reconnaissance role using the LOROP pod. The Kargil war of July 1999 saw Jaguars of Nos 5 and 27 Squadrons being used with the Vinten infra-red line-scan reconnaissance pod.

At AFS Lohegaon in Pune during October 2001, these Jaguars of No 6 Squadron comprise two IS jets, Agave radar-equipped IMs — the grey machines — and a two-seat IB. KEY/ALAN WARNES

Even before DARIN I production by HAL ended, it was decided to use components and experience from the manufacturer's LCA (Light Combat Aircraft, now known as the Tejas) and the Su-30MKI and MiG-27 upgrade programmes to bring two squadrons' worth of NAVWASS aircraft — six fighters and 24 trainers — to DARIN II standard with a new SAGEM inertial navigation system and GPS, and DRDO mission computer. Perhaps the most visible change as a result of the NAVWASS Upgrade Programme came in the form of the reshaped nose housing a Thales LRMTS. Among other changes, the Boeing Harpoon anti-ship missile was integrated to replace the obsolete Sea Eagle, the Elta ELM-2032 multi-mode radar equipped the maritime version, an Elta jamming pod took the place of the port gun, and the pilot was provided with HOTAS (hands on throttle and stick) controls.

Simultaneously, given the increased operational tasking and workload, the IAF ordered 17 DARIN II two-seaters, serials JT066-JT082, and 20 DARIN II single-seaters, JS206-JS225. HAL and the IAF developed and certified a new air-to-air refuelling probe on the two-seaters. These aircraft allowed No 224 Squadron at Jamnagar to convert from the MiG-23MF in April 2008.

An AGM-84L Harpoon anti-shipping missile arms this Jaguar IM. First Harpoon test-firings from an Indian Jaguar took place in 2015. IAF

As the expertise of HAL and the DRDO grew, it was decided to upgrade the remaining 61 DARIN I aircraft to DARIN III standard. This revolved around an indigenous, open-architecture mission computer from the LCA, three multi-function displays in the cockpit, a radar warning jammer integrated with laser warning and a missile approach warning system. All DARIN III fighters will get the Elta ELM-2052 active electronically scanned array radar in a new radome, while the latest weaponry will include ASRAAM (the Advanced Short-Range Air-to-Air Missile), the IAI next-generation LGB, Textron CBU-105 cluster anti-tank munition, IAI Rampage air-to-surface missile, and the DRDO's Smart Anti-Airfield Weapon and Rudram long-range anti-radar missile. The addition of the Rafael Software Defined Radio with satellite communications and datalink allows the Jaguar to plug into the AWACS and surface radar-fed air command and control network, making it one of India's most potent fourth-generation fighters.

Very few aircraft have yet consumed even half their fatigue life, but it is expected that the oldest of 40 British-manufactured and 128 HAL-built Jaguars, the DARIN IIs, will start being retired from 2035 onwards. ***Vikram Singh***

Operating out of its home base with Escuadrón de Combate 2111 at Taura, an Ecuadorian Air Force Jaguar ES departs on a sortie during 1986's joint US-Ecuadorian exercise 'Blue Horizon'. USAF

Ecuador

An order for a batch of 12 Jaguar Internationals for the Fuerza Aérea Ecuatoriana (Ecuadorian Air Force) was announced by BAC in August 1974. The aircraft involved, 10 Jaguar ES jets and two two-seat EBs, would be built on the line at Warton, the single-seaters broadly to the standard of the RAF's GR1. Delivered through 1977, they equipped Escuadrón de Combate 2111 at Taura, while a batch of pilots converted to type on the long course with No 226 OCU at Lossiemouth. Ecuadorian pilots delivered the final two Jaguars of the order, and close contact was kept with the RAF OCU on training and checks, since no Jaguar simulator was available in Ecuador. Three ex-RAF Jaguar GR1s were purchased in 1991 as attrition replacements following the loss of four single-seaters, but the Jaguar was finally withdrawn from service by Ecuador in 2002. Its service is generally seen as successful, the Ecuadorian Air Force being one of the better-funded, better-trained and more operationally capable air arms on the South American continent.

Nigeria

The story of Nigeria's Jaguar Internationals is a short and possibly surprising one. An order for 18 — 13 single-seat Jaguar SNs and five two-seat BNs — was placed in June 1983, along with an option for a further 18 which was never taken up. The single-seaters were broadly to the standard of the GR1, with LRMTS in the nose and overwing pylons for AIM-9 Sidewinder carriage but with uprated Adour 811 turbofans. These 18 aircraft, delivered from late 1984 to mid-1985, were used to equip a squadron at Makurdi and intended to provide the Nigerian Air Force with a deep strike capability. As it turned out, Nigerian Jaguar operations were hampered by insufficient funds, political instability, non-availability of suitable weapons and a lack of spares and support. As a result, they did very little flying and had been grounded and withdrawn by 1985, some having fewer than 150 hours on the airframe. Attempts to sell the remaining aircraft to — or through — BAe failed, and they were left to rot on the airfield.

Four Sidewinder-toting Jaguar S(O) single-seaters from 8 Squadron, Sultan of Oman's Air Force in the early 1980s. BAE SYSTEMS

Oman

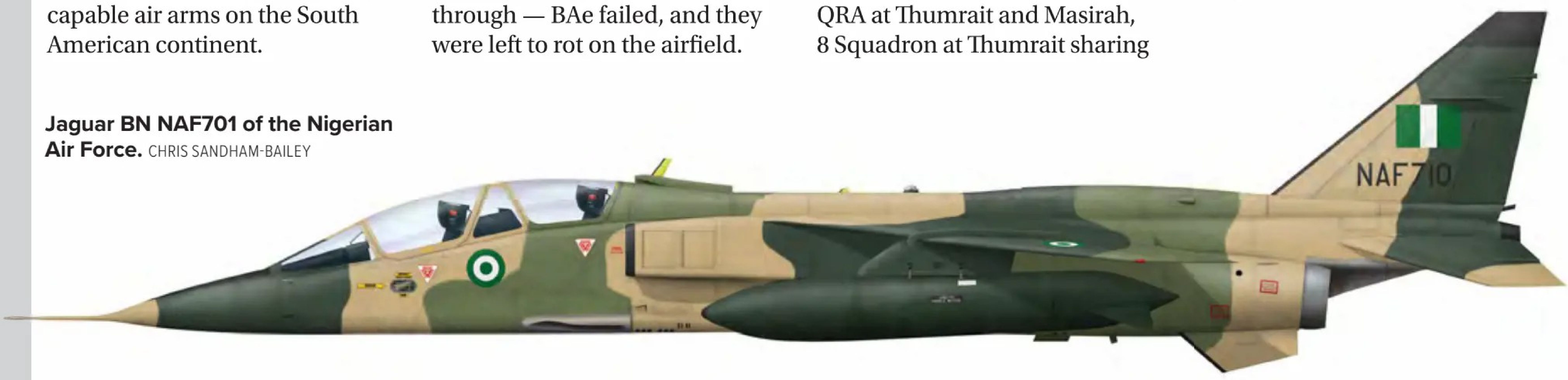
The Sultan of Oman's Air Force (SOAF), which became the Royal Air Force of Oman (RAFO) from 1 August 1990, ordered 12 Jaguars — 10 examples of the single-seat Jaguar International OS and a pair of two-seat Jaguar OBs — in August 1974. These were delivered to 8 Squadron at Thumrait. A second order, for a further 12 aircraft, was placed in 1980, the two OBs in this contract having a fixed, nose-mounted flight refuelling probe. The arrival of these aircraft from 1983 allowed the formation of a second unit, 20 Squadron, which split off from 8 before moving north to Masirah. Two further ex-RAF Jaguars, a T2 back from loan to India and a GR1, were added in 1982 and 1986 respectively. All Oman's aircraft were British-built on the Warton line and had the Adour 804.

SOAF Jaguars were armed with AIM-9P Sidewinders on the outer underwing pylons, two 30mm ADEN cannon, laser-guided bombs, 1,000lb freefall and retarded bombs, CRV-7 rockets and BL755 cluster bomb units. Unusually — and probably uniquely — the SOAF aeroplanes had an air defence role, holding QRA at Thumrait and Masirah, 8 Squadron at Thumrait sharing the duty with the Hunters of 6 Squadron. SOAF/RAFO pilots were converted to the Jaguar on 8 Squadron at Thumrait, although some Omani pilots took qualified flying instructor and qualified weapons instructor courses on the RAF OCU at Lossiemouth, and links with the RAF were close. The 21 remaining Omani Jaguars were returned to Warton from 1988 for an update to replace NAVWASS with the Ferranti 1064 nav/attack system, this programme being completed in October 1989.

In the early days of Jaguar operation there were few Omani pilots, most being either ex-RAF contract officers or RAF loan service, but over a decade these were largely replaced by Omani nationals. To the SOAF's great credit, this was achieved while maintaining standards and a high level of operational effectiveness. Servicing of the Jaguar fleet was undertaken by Airwork Services, but subsequently by uniformed SOAF/RAFO engineers, a mix of Omani and expatriate personnel.

8 Squadron retired its final Jaguar in August 2014, an event which marked the end of 37 years of Omani operations. Today it has re-equipped with the Eurofighter Typhoon.

Jaguar BN NAF701 of the Nigerian Air Force. CHRIS SANDHAM-BAILEY



INSIGHTS

Seasoned Jaguar hand Mike Rondot recalls flying the strike jet he so loved

A T2A leads two GR1As in this No 226 OCU trio in January 1986. DENIS J. CALVERT

Today a renowned aviation artist, Mike Rondot flew the Jaguar on four tours, with Nos 6, 41 and 54(F) Squadrons at Coltishall and No 31 Squadron at Brüggen. He has 2,500 hours on type. After six years on Canberras, followed by time on the Hawk and Hunter, he recalls, “I joined the Jaguar long course on No 226 OCU at Lossiemouth in 1980 on No 36 Course, which was one of those with the highest wastage. We started with eight students, we finished with three.

“The Jaguar was a very easy aeroplane to fly, but it had to be, because it was so difficult to operate. So, I didn’t find converting to fly the aircraft difficult, but I did find coping with the workload quite a shock. The long course had quite a lot of new stuff and was quite intensive. Like all flying courses in the RAF, if you stumble it’s very hard to get your pace back. People would fall by the wayside just overnight. They’d do one phase of the course satisfactorily, move on to the next phase — strafing, bombing, low-level navigation — and the wheels would come off. No 36 Course became quite iconic. So iconic that when we finished, we had some T-shirts made that said, ‘I survived 36 Course’. We only had three T-shirts made!”

The Jaguar has a reputation of being underpowered. How fair was that criticism? “Everybody said it was underpowered and made a big joke about it, but you could say that all the aeroplanes I’d previously flown were overpowered. The Jaguar was underpowered if you wanted to compare it with a dogfighting aeroplane, but that wasn’t was it was designed to do. It did what it was designed to do, to fly at 420kt and go a very long way with a decent load of bombs.

“With the Adour 102 engines originally on the Jaguar, when you loaded the aeroplane up it needed a lot of runway to get airborne, and once you started going around corners it slowed down. If you wanted to go fast, it would go fast. You could always spot a Jaguar pilot; his left elbow was permanently locked. There was only one power setting in the Jaguar, and that was full power.”

The Jaguar is credited with Mach 1.3 performance, but whether it would get there in practice has often been questioned. “I flew a lot of people in the two-seater — groundcrew, air cadets, all sorts”, says Rondot. “I used to show them 650kt on the air speed indicator. And I’d say, ‘You’ll never live to see this again, unless you fly in a Tornado F3 or similar’. The Jaguar could easily get to 650kt at 250ft. But there was never any need to go supersonic, although during the Gulf War we flew them supersonic, not simply because we were flying very high,

DATAFILE

SPINE-BENDING

As first built, the Jaguar had a failing; under high-g situations, the fuselage would distort slightly. As a result, while the rudder control rod which passed through the spine atop the fuselage stayed the same length, its effective length changed, which caused an uncommanded roll. A ‘spine-bending mod’ was implemented in the late 1970s, using a potentiometer on the spine that measured the distortion and fed a countering input to the rudder auto-stab without the need for pilot input. Should the auto-stab fail, the aircraft was limited to 4g.

A typically dynamic Richard Cooke shot of four No 6 Squadron jets. ALAMY

but on several occasions we barrelled in to the attack in a 60° dive and, as I released my weapons, I was supersonic. If you took the wing tanks off you could get it up to nearly 700kt and one guy, Graham Wardell, claimed to have seen 705kt on the clock. I've seen 690kt. That was as fast as I wanted to take it. Certainly, you'd never get near that in a Buccaneer or Hunter."

But was take-off performance fully loaded less than sparkling? "It wasn't sparkling, but I never had any trouble with it. I remember that when I first arrived at Coltishall, the airfield was shut while they resurfaced the runway. We operated out of Sculthorpe, and that had a very long runway. I'd just arrived on the squadron, and one of the very first sorties I did was to fly with a guy called Derek Bridge, on his wing. On take-off, we got to 130kt and we still hadn't lit the 'burners. I was thinking, 'are we doing a cold power take-off?' But eventually he lit the 'burners and off we went. He just said, 'well, it saves a bit of fuel.' In practice, you'd always use full 'burner for take-off, because if you had an engine failure on take-off, you needed every ounce of thrust you had. The afterburner was fully variable and very reliable. We used it indiscriminately at all altitudes."

Demonstrating a prodigious load-carrying ability for an underpowered aircraft with little wing to speak of, No 14 Squadron Jaguar GR1 XX955 is captured in the course of releasing eight 1,000lb bombs. BAE SYSTEMS VIA MIKE RONDOT

One slightly unusual feature of the Jaguar's airframe was that it didn't have conventional ailerons. Instead, it had a two-section spoiler on the upper surface of each wing, which allowed full-span flaps right across the trailing edge. Did this make any difference in handling?

"No. We had tailerons, differential tail, and the spoilers. The idea was that the combination of the spoilers on top of the wing and the differential tail would sort out the problem of yaw in the turn. They didn't quite get it right, and they ended up with a very complex design. There was something called a spine bending compensator [see boxed item] built into the aeroplane's auto-stabilisation system. The Jaguar always had a problem with roll/yaw coupling. If you tried to change the pitch angle and change the roll angle together, quickly you could — and people did — make the aeroplane tumble [depart]."

With its relatively short-span wing, the Jaguar had only four wing stations and one centreline pylon, far fewer than the nine stations on the Phantom the Jaguar replaced in RAFG service. "In the early days, pre-1984-85, we'd carry four bombs", Rondot recalls of the standard load. "Two inboard wing tanks, a bomb on each outer pylon and two bombs on the centreline. When ECM pods and chaff pods became available, they took up the outer pylons, so it then became two bombs on the centreline or a single 1,200-litre tank on the centreline with two bombs on each of the inboard pylons.

"We didn't like flying with a centreline tank because it restricted the aeroplane in alpha [angle of attack] and affected the handling. So, with a centreline tank you could carry four bombs inboard plus Phimat [a chaff dispenser] and an ECM pod outboard. Phimat and AN/ALQ-101 came in around 1984-85. That then became the standard war fit. When the Jaguar was in the strike role, it carried one bomb, WE177, on the centreline.

"The Jaguar was really nice to fly low-level and fast. The faster you went, the more stable it was, until you got to around 550kt when it started to get very pitchy. We used to fly the recce Jaguar with two tanks, recce pod [on the centreline] and, occasionally, outboard CBLS [BL755]. That was a very heavy — and draggy — fit. It flew well until you went around corners. Then, you needed a lot of power to maintain air speed."

Spinning was prohibited in a Jaguar, but would the aircraft spin following a stall? "If you got very slow with high alpha and it departed, most times it wouldn't spin. It just took a huge amount of altitude to recover, often 20,000ft-plus. Basically, the Jaguar was unrecoverable from a spin. The pilot's notes said 'don't', especially in the two-seater. That said, quite a few people did spin it if they let the speed get really low and didn't do the right thing — the right thing being to unload to 6 alpha [6° AoA] and just keep it there. In most cases the aeroplane would recover if they did that and they had sufficient height."

The author thanks Pierre-Alain Antoine, Geoff Brindle, Rod Dean, Ian Ord, William Pixton, Mike Rondot, Andy Sephton and Vikram Singh.

Please help preserve the future of the RAF Coltishall Heritage Centre

Photo credit: Rene Vink

For 66 years, RAF Coltishall, nestled in the picturesque Broads region of East Anglia, was the only RAF station to operate fighter aircraft throughout its operational life. Immerse yourself in the rich history of this iconic Battle of Britain station where the skies roared with thunderous sounds of the Spitfire to the Jaguar.
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Reviews

REVIEWS RATING

★★★★★ Outstanding
★★★★☆ Excellent
★★★☆☆ Good
★★☆☆☆ Flawed
★☆☆☆☆ Mediocre
✎ Enough said

The latest books for the discerning aviation enthusiast

L.A. Birdmen: West Coast Aviators and the First Airshow in America

by Richard J. Goodrich
published by Prometheus Books

L.A. BIRDMEN
WEST COAST AVIATORS AND THE FIRST AIRSHOW IN AMERICA
RICHARD J. GOODRICH

BOOK of the MONTH

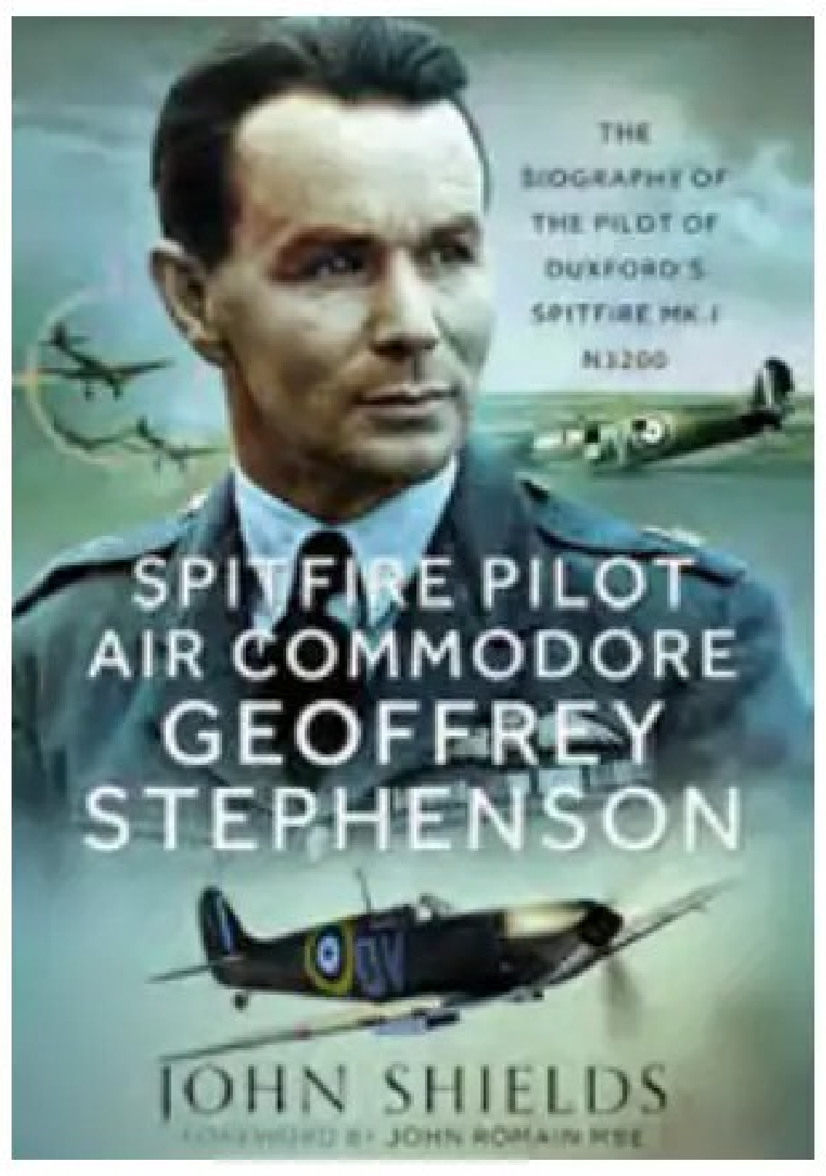
That the Wright brothers completed the first heavier-than-air flight at Kill Devil Hill on 17 December 1903 is a well-known fact, and chapter one starts with a good, balanced account of the four flights made that day. What was new to me here was that the telegram announcing the achievement to their father was intercepted by the telegram operator and leaked to the local newspaper, which embellished the story and added incorrect detail before publishing it the following day in the *Virginian-Pilot*. The incorrect detail? The article described how the Flyer had two propellers; one pushed the aircraft forward, the other pointed downwards and lifted the aircraft into the air, while also stating that it had been witnessed "soaring for three miles". There follows a good account of the activities of Californian dirigible pilots over the following years, with Roy Knabenshue and public displays of his *California Arrow* featuring prominently. Then in 1910 came the big event, the first American airshow, promoted by one Dick Ferris, in Los Angeles. Ferris made great efforts to get aviation's new 'stars' to attend. Glenn Curtiss signalled his intention to be there, but most of the French aviators including Blériot and Farman showed no interest and refused. Nevertheless, the Los Angeles Aviation Meet took place over 10 days, with great newspaper coverage reporting how pilots performed "death-defying stunts". Nothing new there, then.

The author's text is engaging, at times whimsical but always eminently readable, and brings to life the story of the birth of American flying with a great deal of detail and some wonderful asides. Each chapter leads in with a pertinent, contemporary quotation. That to chapter 10 offers, from the *Billings Daily Gazette*, "Roy Knabenshue may not be a bird, be he has successfully demonstrated his ability to fly like one, and what is still of more importance to himself, alight like one". If there is any down-side to this title it's a relatively small one; it's printed on cream paper stock, which reproduces the photos fairly well but the 'black-and-cream' tone is less than flattering to their interesting subjects. ***Denis J. Calvert***

ISBN 978-1-493084395; 9.3 x 6.3in hardback; 309 pages, illustrated; **US$29.95/£25.00**
★★★★

Spitfire Pilot Air Commodore Geoffrey Stephenson

by John Shields
published by Pen & Sword Air World


THE BIOGRAPHY OF THE PILOT OF DUXFORD'S SPITFIRE MK I N3200
SPITFIRE PILOT
AIR COMMODORE
GEOFFREY STEPHENSON
JOHN SHIELDS
FOREWORD BY JOHN ROMAIN MBE

The name of Geoffrey Stephenson has, finally, gained some of the prominence it deserves. The rebuild to flying condition of 'his' No 19 Squadron Spitfire Ia, N3200, its operation from its old Duxford base by the Imperial War Museums and the dedication to him of the Aircraft Restoration Company's newest hangar have all contributed to that. Now, as we trailed with the lead article in our October issue, RAF officer — and former Tornado F3 navigator — John Shields has written Stephenson's biography, shedding much fresh light on his career and how it came to a premature end.

If you read his piece in this magazine, consider it an amuse-bouche for the full volume. Suffice to say, there is a good deal more here, much of it focusing on the years Stephenson spent as a PoW in various German facilities. This, after all, was the course of his war after N3200 was shot down near Dunkirk. Quotes drawn from his surviving letters home offer a very good flavour of his captivity. The account of Stephenson's fateful final flight, testing an early F-100 Super Sabre in the USA, and the subsequent investigation is extremely detailed. Welcome, too, is the chapter on N3200's resurrection, while John Romain provides the foreword. Given the life experienced by its subject, this is far from being a typical pilot biography, and more notable for it. ***Ben Dunnell***

ISBN 978-1-03610-540-2; 9.5 x 6.4in hardback; 316 pages, illustrated; **£25.00**
★★★★

American Experimental Fighters of WWII: The Pursuit of Excellence

American Experimental Fighters of WWII
The Pursuit of Excellence
Tony Buttler

by Tony Buttler
published by Hikoki Publications/Crécy

Given how ubiquitous the most successful US-built fighter types of the Second World War became, the sheer range of other projects that generally failed to progress to the production stage may surprise. Yet Tony Buttler, who can always be relied upon to produce a meticulously researched read, has nonetheless been able here to bring together a very weighty book covering fully 24 of them, one per chapter. Some are variations on familiar machines, such as the P-38, P-40, P-47 and P-51, but others most definitely are not. It is, therefore, especially welcome to see the likes of Bell's XP-77 'mini-fighter' given such prominence, in what must be the most detailed account yet printed, or indeed the various 'flying wings', like the Northrop XP-79, which had just about the briefest of flying careers.

The text on each aircraft offers as much information as is probably available on their gestation and testing, with plentiful references to archive reports. It's all easy to read, and the imagery is plentiful with generally good reproduction. Negatives? There's the odd typo, such as mention of the "Grumman F6F Wildcat" in the author's introduction; the correct form, I have long been informed, is Army Air Forces, not Army

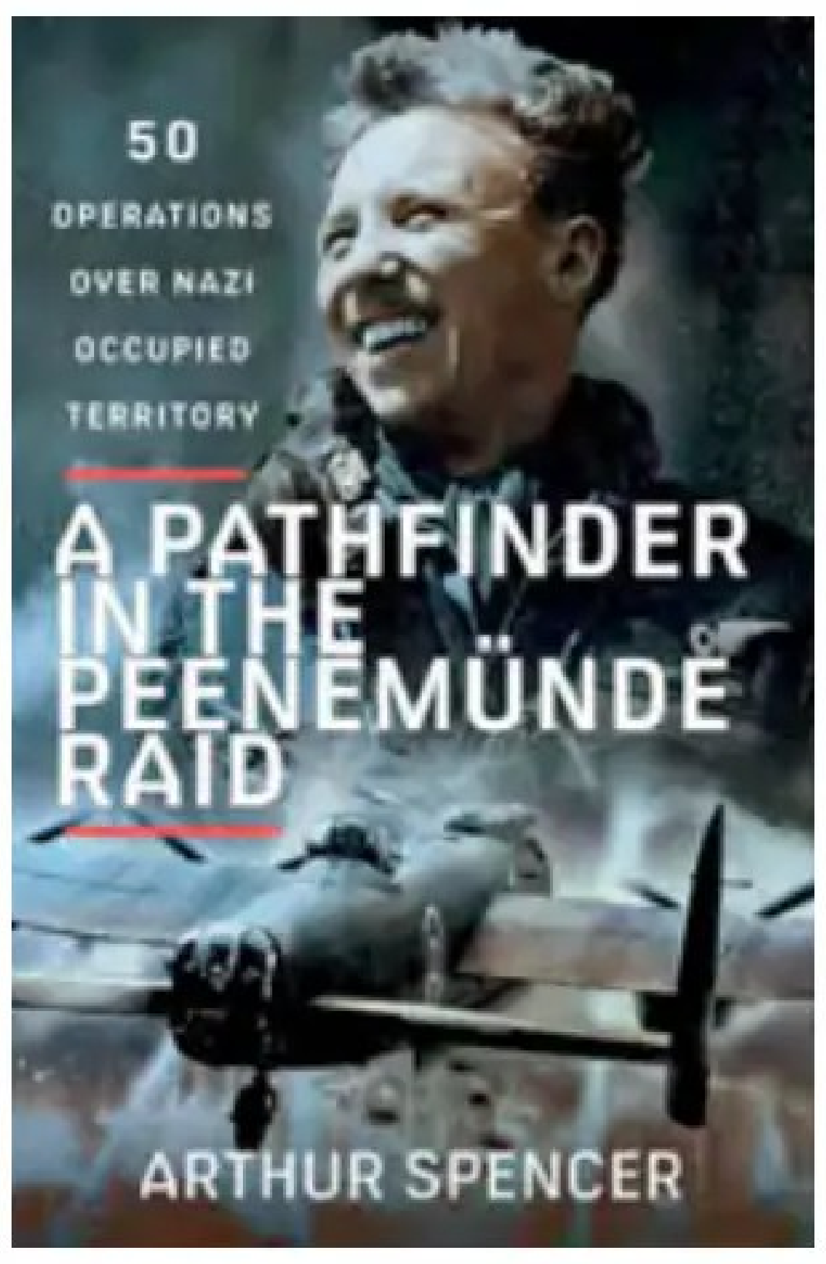
Air Force; and the photo captions, even bearing in mind how many there are, are a bit repetitive in style. Really, though, I'm picking nits here. Another very good volume on some lesser-known aeroplanes. ***BD***

ISBN 978-1-80035-310-7; 12 x 8.5in hardback; 320 pages, illustrated; **£34.95**

★★★★

A Pathfinder in the Peenemünde Raid

by Arthur Spencer
published by Pen & Sword Military


50 OPERATIONS OVER NAZI OCCUPIED TERRITORY
A PATHFINDER IN THE PEENEMÜNDE RAID
ARTHUR SPENCER

This is the story of Arthur Spencer, born 1921, who enrolled in the RAF aged 19 to train as a pilot on courses in Florida and Alabama. Some way into these, while flying the Vultee BT-13, he was failed by a less-than-sympathetic American instructor, who himself had only recently finished pilot training. Spencer then joined a navigator training course at Pensacola, at the completion of which he crewed up with an experienced civilian pilot, a just-qualified second pilot and a wireless operator to deliver a new Lockheed Ventura across the Atlantic for the RAF.

There follows an account of Spencer's OTU training in the UK, his posting to No 97 Squadron — one of the first to fly the Lancaster — and his time on operations. The author is clearly not one to dramatise things; he writes matter-of-factly of the 600-bomber Operation 'Hydra' attack on Peenemünde where his squadron came through unscathed, but overall the Lancasters of No 5 Group suffered nearly 20 per cent losses. Examples of RAF black humour are not forgotten; at the meal before a raid, an aircrewman might ask, "Can I have your egg if you're not back tomorrow morning?" A good, human story, well-told. ***DJC***

ISBN 978-1-39907-984-6; 9.5 x 6.4in hardback; 88 pages, illustrated; **£20.00**

★★★

Gestapo Hunter

by Sean Feast
published by Grub Street

Even though so many of his compatriots on certain operations were outstanding men, Ted Sismore deserves singling out. Somehow he survived flying as a navigator on Blenheims, both in the UK and Malta, with No 110 Squadron in 1941. A short time on Whitleys as part of No 24 OTU, including involvement in a 'thousand-bomber' raid on Bremen and a smaller attack against Düsseldorf, "convinced Ted that he was not cut out for Main Force operations". The Mosquito, though, was a different matter.

GESTAPO HUNTER
The Remarkable Wartime Career of Mosquito Navigator and Leader
TED SISMORE
DSO DFC* AFC
SEAN FEAST

Joining No 105 Squadron during November 1942, he came into his own in the de Havilland twin, beginning with the following January's daylight strikes on the Haus des Rundfunks — home of the Nazi state broadcasting service — in Berlin during addresses by Göring and Goebbels. Subsequently, as a planning officer at No 2 Group HQ, Sismore was instrumental in putting together the Operation 'Jericho' Amiens prison raid, though he was forbidden from flying on it, and the famed Mosquito attacks on Gestapo facilities in Aarhus and Odense, both of which he took part in.

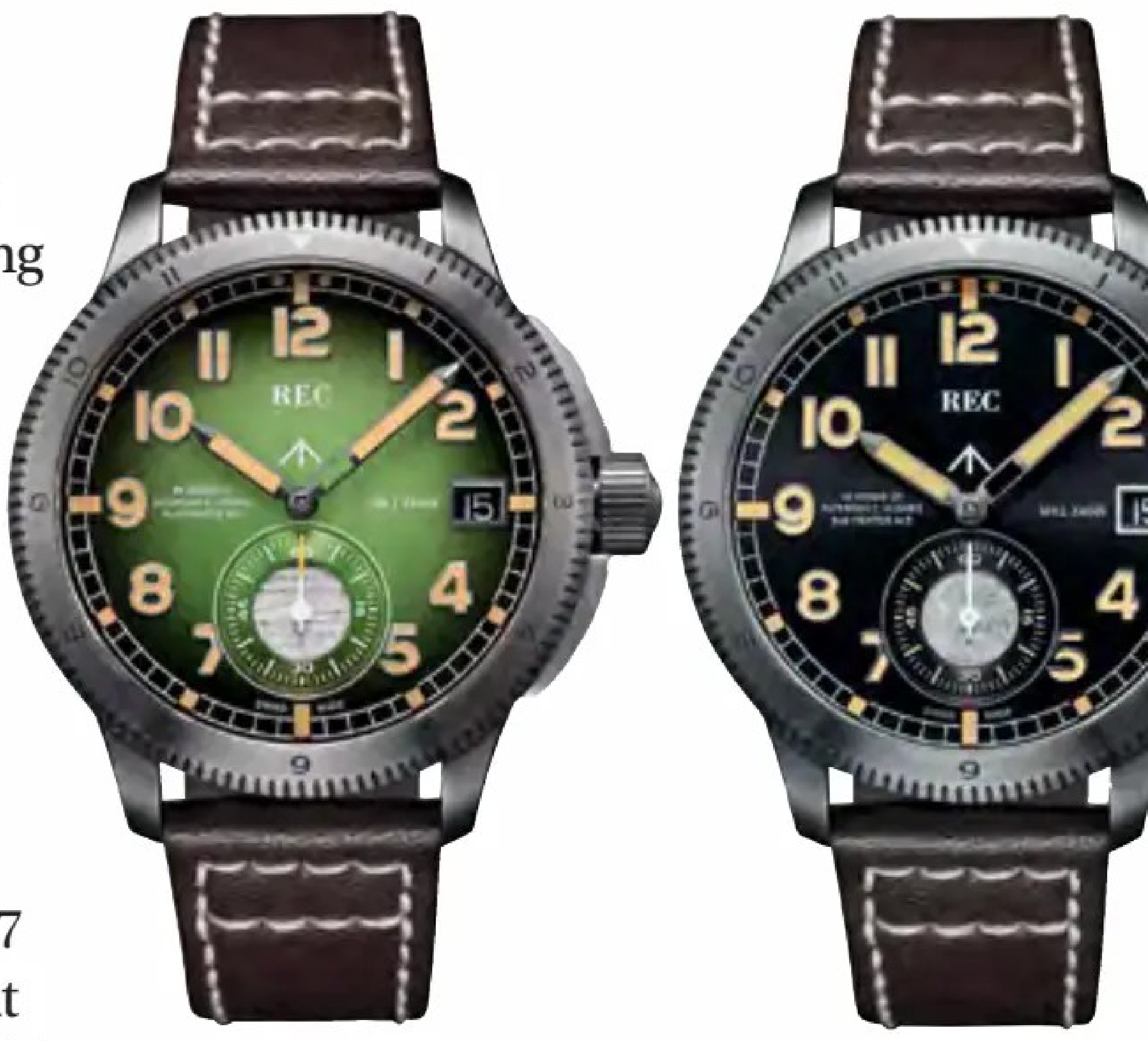
Sean Feast — whose work you will no doubt have read in these pages — always tells these stories well, writing elegantly rather than merely offering a dry recounting of dates and events, and here he proves to be a very fine guide to such an interesting career, on into the post-war years. It's based largely around interviews with Sismore, who died in 2012, but backed up by material from his colleagues and official records. *Gestapo Hunter* is a tale that definitely needed recounting, and well worth your 25 quid. ***BD***

ISBN 978-1-911714-11-8; 9.5 x 6.4in hardback; 208 pages, illustrated; **£25.00**

★★★★

WATCHES

REC X4009

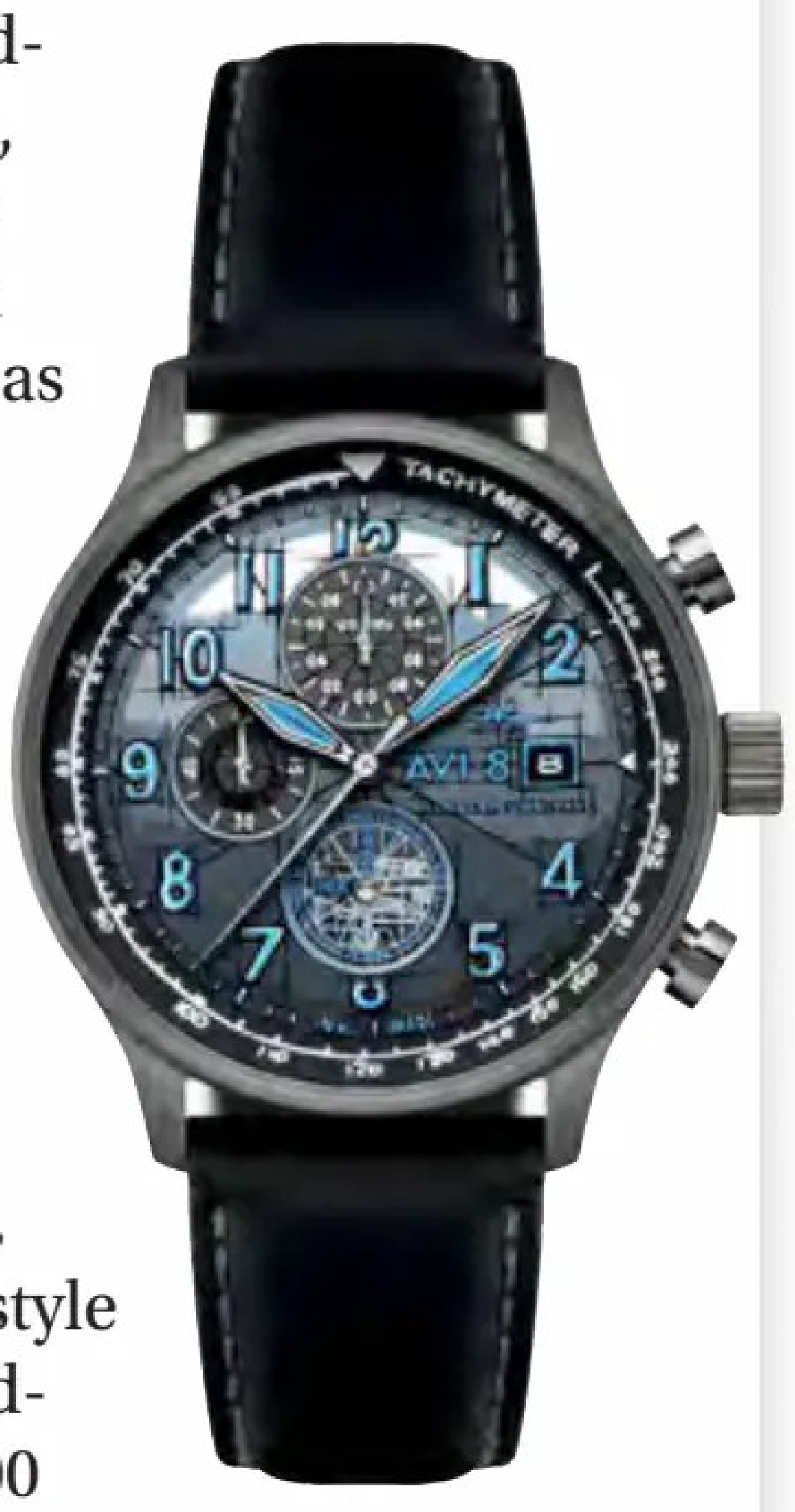


Spitfire Ia X4009 was piloted by Pat Hughes DFC during the Battle of Britain. On the strength of No 234 Squadron, he flew 21 sorties in the aircraft as part of the summer 1940 campaign, scoring 10 of the 17 aerial victories that made him Australia's most successful pilot in the battle, prior to his death in combat on 7 September. The wreckage of X4009 having been recovered many years later, it is now being restored to airworthy condition for the Hunter Fighter Collection of Scone, New South Wales.

A portion of the sale price of each timepiece in the new X4009 collection is being donated by REC towards the Spitfire's restoration. They feature aluminium from the original fuselage, integrated into the small-seconds sub-dial at the six o'clock position. Aspects of the case design have been inspired by the Spitfire, while the dial is, says REC, a reimagination of the 'Dirty Dozen' watches worn by RAF pilots during wartime. The case-back displays the Sellita SW-461 movement, and features a rotor depicting X4009 in flight. Shown are the Anthra Grey and Hunter Green versions.

Price: **£1,795**
Information and ordering:
www.recwatches.com

AVI-8 Hawker Hurricane Inkdial Chronograph



For its newest limited-edition chronograph, AVI-8 has teamed up with visual artist Ben Li, otherwise known as Inkdial, to produce a timepiece combining his contemporary design with a classic aviation subject. It adds "gridlines and artistic markings" to the Hurricane watch, creating a blueprint style almost akin to a hand-drawn sketch. Just 400 examples are on sale.

Information and ordering:
www.avi-8.co.uk

The **MARCH 2025 ISSUE** goes on sale in the UK on **13 FEBRUARY 2025**
Contents subject to change

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Lettice Curtis

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AEROPLANE MEETS… JOHN ROMAIN

Fifty years of experiences from a key figure in the warbird scene

CHRIS GIBSON

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SDASM

DATABASE

US MIXED-POWER FIGHTERS

AEROPLANE

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